JUL 2 2 1946

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JULY, 1946—44th YR.

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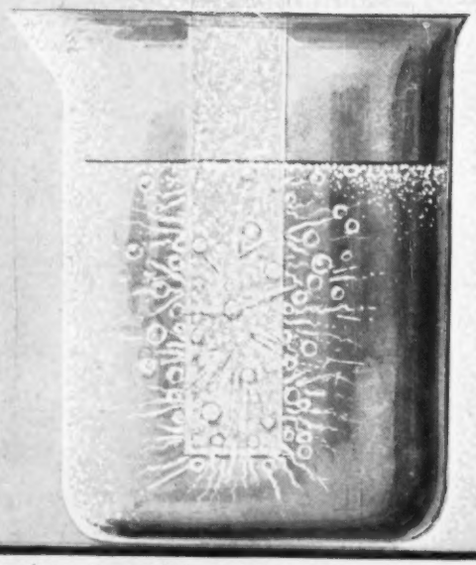

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SIMPLIFIED FAST BUFFING COMPOUND REMOVAL PRIOR TO BRIGHT NICKEL AND OTHER PLATING SOLUTIONS

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538 FOREST STREET, KEARNY, N. J.

METAL FINISHING

PREPARATION, ELECTROPLATING, COATING

Founded as Metal Industry, January, 1903 by Palmer H. Langdon, 1868-1935

VOLUME 44 JULY, 1946 NUMBER 7

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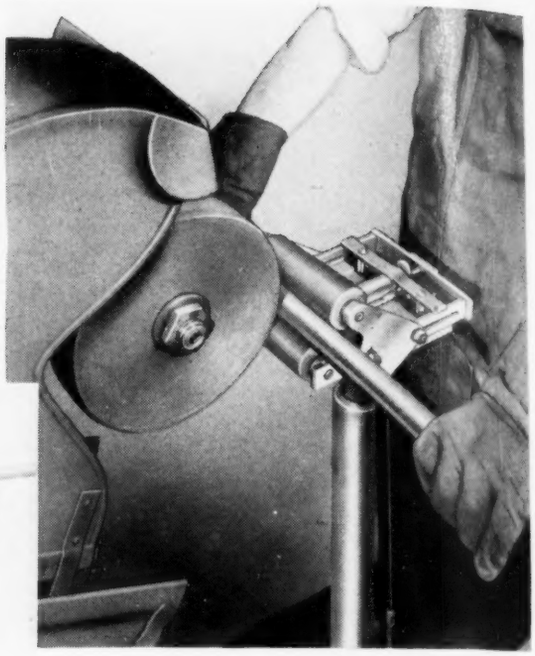
Polishes Tubing Many Times FASTER

Produces Uniform Finish No Spiraling Effect



Polishing tubes evenly at high speed is easy with the PRESTO Semi-Automatic Tube *Polishing* Machine. As the tube rotates it feeds automatically across the polishing wheel or belt producing a uniform finish free from the spiraling effect which is prevalent when tubes are polished by hand.

ALL OVER the country, from coast to coast, PRESTO Semi-Automatic Tube *Polishing* Machines are speeding production, avoiding spoilage and producing uniform finish not attainable in production by hand polishing.

Completely portable and adjustable, the PRESTO Semi-Automatic can be set up to any standard polishing lathe in a jiffy. You merely push the machine up to the wheel, adjust for height and to fit the tube, insert the tube and start the lathe. Total setting up time is less than five minutes.

You can polish tubes from ¾″ to 5″ diameter and in any length, using PRESTO Tube Support Stands for long tubes as illustrated.

Rollers of the Tube Support Stand are adjustable to fit the tube and to coordinate with movement of tubing across the polishing wheel or belt.

Ask your Jobber or write for Bulletin 103.

Presto
POLISHING ROOM
Accessories
BULLETIN 103
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Spinner Ceiling Support Page 2
Polishing Wheel Balance Ways Page 3
Tube Polishing Machines Page 4
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The MANDERSCHEID Co.
810 Fulton Street, Chicago 7, Illinois
Serving the Metal Finishing Trade over 35 Years.

Send for your copy of the new PRESTO Catalog.

The MANDERSCHEID Co.

810 Fulton Street, Chicago 7, Illinois

Serving the Metal Finishing Trade over 35 Years.

VOL. 44, NO. 7 METAL FINISHING JULY, 1946
PREPARATION, ELECTROPLATING, COATING

Plenty for Christmas

Perhaps we are unique among editors in frankly admitting that we do not know whether O.P.A. should or shouldn't be continued. It is our belief that we'll never know whether things would be better in the long run without price controls unless we try it. On the other hand, we wouldn't want the responsibility of forcing this step. Congressmen can chance it since Congress as a whole will shoulder the blame if things go wrong, not the individual member.

The most recent prediction by Chester Bowles, Director of Economic Stabilization, is to the effect that, if O.P.A. controls are continued, Christmas will see the arrival of "a flood of goods that will amaze us all." All we can say to this is that we certainly will be amazed.

Under the present system, we do not see how the flood of goods will be possible in six months. And many manufacturers are wondering right now, what they are going to do next month. As this is being written, there are practically no cloth buffs, no silver, very little steel, copper, cadmium, lead, tin, soap, alkalies and a host of other materials needed to keep production going. Labor costs have risen sharply without a corresponding increase in productivity. In our own industry many plants have even shown a definite drop in man-hour output, profits have declined appreciably, and we know more than a few plants which are operating at a loss.

There are many answers to the question as to why these plants continue to operate when they know they are losing money. Some hope that materials will soon appear in sufficient quantities so that, by increasing their output, they can reduce their unit cost to the point where they can show a profit. Many are hoping to get a price increase eventually and, in the meantime, hesitate to shut down for fear of losing their trained help, knowing that, with the present labor shortage, they will have great difficulty getting into full production again.

If industry can keep going until the end of the year under the conditions prevailing at present, there may be a flood of goods. What worries us is how they will be able to do it.

Thirty-third Annual Convention of the A.E.S. Held at Pittsburgh

Written Especially for Metal Finishing

By GEORGE B. HOGABOOM, Consultant

THE enthusiasm of electroplaters for attendance at their annual conventions was not dimmed by the omission of the 1945 sessions. The registration missed the record set at Cleveland by 208—1040 as against 1248. To accommodate all at the banquet it was necessary to have tables in the balconies. The educational sessions were held in the largest room in the hotel, which did not have seating capacity for those attending and there was standing room only. The thirst for knowledge overcame all other thirsts despite the heat that compelled "shirt sleeves" and open collars.

The attention given the presentation of papers and the pointed questions were a direct compliment to the electroplaters, as indicating the real reason for attending. The limited time for further information forced an extra session which was one of the best of the convention. Even after the interruption by the broadcast of the "big fight" many wanted to return to ask more questions. The "*Proceedings*" of the convention will surpass all former issues in both quality and quantity of electroplating knowledge.

The outstanding feature of the convention was the *Research Committee* session presided over by Chairman *Carl Heussner*. It was a veritable university of learning with classes under the tutelage of seven college professors and two Ph.D.'s. No session of any technical or scientific society ever presented the outline of the investigation of the problems and of the unknown factors of subjects that enter into the vocation of their members in such a broad, comprehensive manner. The keystone of the A.E.S., "*An Educational Society*," was firmly placed.

The convention was called to order by President *Walter L. Pinner* and turned over to the chairman of the Convention Committee, *Mr. S. S. Johnson*. Invocation was offered by *Rev. F. C. Mesle*. A hearty welcome to Pittsburgh, although mention of the proverbial key was omitted, was given by *Hon. David L. Lawrence*, Mayor of Pittsburgh. President *Frank R. Keller*, Pittsburgh Branch, greeted the A. E. S. delegates. President Walter L. Pinner called the Convention to order and the delegates from the several Branches were accepted. The President made his annual report.

Annual Business Meeting

Among the subjects discussed at the annual business meeting on the last day of the Convention were the revision of the Constitution on which subject a committee is to be appointed and the publication of an electroplating handbook under the direction of *Dr. C. L. Faust*. The proposed specifications of the *A. S. T. M., A. E. S.* and *Bureau of Standards* on nickel, cadmium and zinc deposits were approved.

The following amendments to the Constitution were adopted: Limitation of $5 as a registration fee at the annual Convention was discontinued; applications for membership in any branch of the A. E. S. can be acted upon by the branch concerned without publication in the *Monthly Review*, published by the Society, and the insertion in the application blanks for membership of the following wording: "Have you been a member of any branch of the A. E. S.?"

Election of Officers

Frank K. Savage, Chicago Branch, was elected Supreme President; *Kenneth M. Huston*, Baltimore-Washington Branch, was elected First Vice-President; *Samuel S. Johnston*, Pittsburgh Branch, was elected Second Vice-President; *Arthur Logozzo*, Hartford Branch, was elected Third Vice-President; *Dr. A. Kenneth Graham*, Philadelphia Branch, was elected Executive Secretary and Editor.

Horace H. Smith, Newark Branch, was elected an Honorary Member of the Society.

Frank Savage
Supreme President

Kenneth M. Huston
Supreme First Vice-President

S. S. Johnston
Supreme Second Vice-President

Arthur Logozzo
Supreme Third Vice-President

Dr. A. Kenneth Graham
Executive Secretary and Business Manager

Walter L. Pinner
Past Supreme President

Convention City

The 1947 Convention will be held in Montreal, Canada.

International Convention

The Society plans to hold an *International Convention* in 1948 and the Newark Branch desires to be host at Atlantic City, N. J.

The Herminie Dorothea Proctor Award of $100.00

Awarded to *Dr. Abner Brenner* and *Grace E. Riddell* of the U. S. Bureau of Standards, for their paper entitled *Deposition of Nickel by Chemical Reduction.*

Founders Gold Medal

Awarded to *Chester W. Smith* of the *Detrex Corp.*, Detroit, Mich., for his paper entitled *Examination of Electro-Cleaned Steel by the Electron Diffraction Technique.*

A. E. S. Gold Medal

This award went to *Myron B. Diggin, Hanson-Van Winkle-Munning Co.*, Matawan, N. J., for his paper entitled *Purification of Electroplating Solutions.*

Fifty Dollar Prize for Best Paper in the Monthly Review

Awarded to *J. J. Dale* for his paper entitled *"Hard Chromium Plating* which was published in the June, 1945, issue of the *Review.*

S. Huenerfauth Cup

Awarded to the Newark Branch for the paper entitled *Cadmium Whiskers*, presented by Howard L. Cobb, Librarian.

Complete List of Exhibitors

International Nickel Co., New York, N. Y.

Apparatus to electroplate nickel on wire up to 4500 amp./sq. ft. at 950 ft. per minute. Normal current density 500 amp./sq. ft. for nickel deposition using the Wesley chloride solution.

Rustless Iron and Steel Corp., Baltimore, Md.

Electropolished steel wire and wire products.

Oneida, Limited, Sherill, N. Y.

Silver plated bearings for aircraft.

Allison Division, General Motors Corp., Indianapolis, Ind.

Aircraft and automobile bearings of a large number of types, electroplated with silver, lead, indium, copper and other metals.

Buffalo Branch

Reproductions in copper electrotypes. Four *subjects* of plating room methods: electroplating, dipping, barrel plating, finishing.

United Chromium, Inc., New York, N. Y.

Pyrophosphate copper electrodeposits, black on zinc, chromium plated tools and bright zinc electrodeposits.

Superior Plating and Rust Proofing Co., Minneapolis, Minn.

Extensive exhibit of finishes, coloring of metals, grades of polishing and buffing; electroplating, hard chromium, copper plate for carburizing—decorative finishes.

Honeywell, Minneapolis, Minn.

Several war products including Telescope F. A. B. C.

Bart Laboratories, Inc., Belleville, N. J.

Electroforming—reflectors, phonograph records and several other objects, tubing, electroplated on the inside.

Chromium Corp. of America

Cylinder—porous chromium plated and lapped.

Grand Rapids Branch

Mess trays, tube charger unit, porous chromium plated piston rings, hydraulic landing gear shock strut.

Weirton Steel Corp., Weirton, W. Va.

Steel cans, electroplated with tin and zinc. Deep drawn electroplated steel containers and other products.

Pratt & Whitney Aircraft Corp., East Hartford, Conn.

A large number of bearings, housings and parts of aircraft engine parts. Test pieces for demonstration of the several methods used for determination of the adhesion of electroplated coatings to the basis metal.

Prof. Alfred L. Ferguson, University of Michigan, Ann Arbor, Mich.

Specimens of the test pieces used in determination of adhesion of electroplated coatings used in A. E. S. Project *No. 3.*

Ekko Process Division, U. S. Rubber Co., Cleveland, O.

Nickel-iron alloy electroforming—reflector, radar parts, tubes, etc.

C. G. Conn, Ltd., Elkhart, Ind.

Musical instruments.

Scovill Manufacturing Co., Waterbury, Conn. Also Oakville and Waterville Divisions

Buttons, clock parts, plumbing goods, office metal accessories, fasteners, pins, etc.

American Brass Co., Waterbury, Conn. American Metal Hose Division

Special metal hose parts used in manufacture of radar equipment.

Norfolk and Western Railroad

Locomotive—model.

Columbus Branch

Miscellaneous die castings, ornamental war insignia loaned by Battelle Memorial Institute.

Koppers, Inc., Baltimore, Md.

Porous chromium plated piston rings.

Proctor Electric Division, Proctor Co., Philadelphia, Pa.

Household electric appliances.

Rheem Research Products, Inc., Baltimore, Md.

Extensive exhibit of Iridite and the finishes produced by that process.

Marchant Calculator Co., San Francisco, Cal.

Calculating machine.

Newark Branch

Radar equipment.

***Metal Finishing*, New York, N. Y.**

Copies *Metal Finishing* and *Organic Finishing*.

Exhibits Awards

1st. *Pratt-Whitney Aircraft Corp.*, East Hartford, Conn.

2nd. *Rustless Iron and Steel Corp.*, Baltimore, Md.

3rd. *John Feeley*, Montreal, Canada.

Branch Exhibit

The *Twin City Branch* of the American Electroplaters' Society was the winner of this exhibit.

International Fellowship Club

As always, the *International Fellowship Club* started the ball of good will rolling, which never stopped until the end of the American Electroplaters' Society Convention.

This year there were 96 at the noon day luncheon on the first day of the convention. It was regretted that three of the club's officers were absent, namely, *Frederick Gumm*, *Douglas MacDermid* and *Bob Renton*. *Wilfred McKeon* efficiently filled this gap as no other one could do. His continuous racy talk added spice to the meeting. He announced that all present automatically became members of the club and that there were no dues either collected or assessed.

The absence of the first and second vice-presidents did not prevent their advancement to the office of president and first vice-president respectively:

Douglas MacDermid, president.

Bob Renton, first vice-president.

Lou Hague, general vice-president of *Hanson-Van Winkle-Munning Co.*, was elected second vice-president.

The "three feature picture" was the election of *Frank J. Clark*, *Wilfred S. McKeon* and *George B. Hogaboom* as honorary members. The first two men conceived and organized the Fellowship Club.

The ever-present (not having missed one meeting of the Fellowship Club or a convention of the A. E. S.) *Tom Trumbour*, secretary-treasurer, gave the annual report. He regretted that due to the food situation it was not possible to have a buffet lunch at the "*Open House*" of the convention.

The big note of thanks went to members of the staff of *Metal Finishing* who acted as real hosts and defrayed all expenses of the luncheon.

Open House

The heat of the day had been oppressive but did not deter all present at the convention from attending the "*Open House*" under the auspices of the *International Fellowship Club*. The absence of food had no effect upon the success of the gathering. Two large ball rooms were necessary to take care of the large number of guests. The meeting of old friends and the greeting of new ones marks the Open House as one of the first innovations in the program of the A. E. S. conventions. There is a continuous exchange of good will—a round of handshaking and the enjoyment is without par. With the music from a large orchestra and dancing the program was complete. After 9:30 P. M. and every thirty minutes until midnight, there was a drawing for a Government Bond.

Fellowship Golf Tournament

Winners in the Fellowship Golf Tournament were as follows:

First Prize, a $25 War Bond, won by *Joe Wagner;* Second Prize won by *Larry Rasmussen*, and *Dick Crane* and *Lou Galaso* ended up in a tie for third.

Exhibits of Manufacturers of Equipment, Supplies and Special Processes

Many manufacturers took pride in exhibiting their products in their own show rooms. For the first time moving pictures of the operation of equipment or a story of the processes used was given. It was especially commendable that none of the exhibits were available for inspection and that no moving pictures were shown during any educational session of the convention. Brief descriptions of these manufacturers' exhibits follow:

The Aluminum Company of America, Pittsburgh, Pa.

One of the most elaborate as well as highly instructive exhibits was the one by the Aluminum Company. The tables all around the walls of a large room as well as special display panels were filled with aluminum products finished in or by every method that has been developed for aluminum and aluminum alloys. Anodized, electroplated, Alumilited in various colors and special treated specimens made from die casting, forging, stamping, spinning and every possible forming operation were included.

The electroplated aluminum attracted most of the electroplaters and the Aluminum engineers were kept busy telling the successful method that had been developed after several years' research. The future of electroplated aluminum seems to be assured and every plater wanted to learn the details of the methods used.

To show more clearly the many uses for aluminum and aluminum alloy products four moving pictures were shown. Bulletins were displayed in conspicuous places on which the time schedule of the moving pictures were shown.

1. Dateline of Tomorrow.
2. Fabricating Processes.
3. Unfinished Rainbows.
4. Mine to Metal.

The Belke Manufacturing Company, Chicago, Ill.

A full-sized barrel plating cylinder made of Lucite was of considerable interest to the electroplater. In this barrel the work can be seen during the plating operation in clear solution. A distinct picture of the movement of the work and the contact made with the cathode contacts can readily be seen. Such cylinders have been in successful operation for more than two years.

The specialty of Belke—racks covered with Saran, Neoprene, Hycal, Vinylite and rubber shows how far the covering of racks has progressed in a very short period.

An automatic sawdust dryer makes it easy to separate work from sawdust.

The Chemical Corp., Springfield, Mass.

Luster-on, an inhibited bright dip for use on solid zinc or electrodeposited zinc, attracted considerable attention. The unusual brightness of the finish especially that on dull electroplated deposits gave the article an appearance comparable with the high lustre of decorative chromium deposits. A large variety of specimens indicated the wide range of application of this bright dip. As the finish is proof against finger staining it has a distinct value in the treatment of parts previous to assembly.

A new nickel electro-stripping process called "Stripode" that will not attack the basis metal should prove very useful to a large number of electroplaters. The "press agent's" story seems almost too good to be true. Well just try.

Hanson-Van Winkle-Munning Company, Matawan, N. J.

A complete electroplating experimental laboratory in a single unit was the unique Diggin Control Table. The complete processing of specimens through, cleaning, pickling, rinsing and plating have been done in glass tanks that are set into a section of the table. Arrangements are available for mechanical or air agitation of solution, temperature control, and electrical control within very close and narrow limits. Other experiments can be performed on another section of the table with portable glass containers. These are also equipped for complete control of agitation, temperature and electrical units. The exhibits were as follows:

1. Bright Copper Coating.
2. Alloy plating that served a very useful purpose during the shortage of metals required for war use.
3. Mercil barrel plating units with the new feature of circulating the solution through the cylinder while in operation thereby maintaining a more constant concentration

of the plating solution inside of the cylinder. Numerous types of contacts were on display.

4. A white enameled R. E. I. rheostat was in sharp contrast to many rheostats found in the general electroplating rooms.

5. Rectifiers of the modern type permitting close control of the current.

6. The spray cleaning and rinsing unit, made by Optimus Equipment Division.

7. The newly developed Manodizing Process for anodizing magnesium. The coating produced is an excellent base for paints; it can also be dyed any color. A complete description of the process was given by one of the developers of the process in a paper given during the 5th educational session of the convention.

8. Moving pictures of new full automatic electroplating installation were shown.

(a) Hamilton Standard Propeller Division
Pratt Whitney Aircraft Corporation, East Hartford, Conn.

Zinc plated propeller blades.

(b) Underwood Corp., Hartford, Conn.

Plated parts for adding machines, typewriters, etc.

(c) The Daystrom Co., Olean, N. Y.

Bright nickel and chromium plated metal furniture. This installation has one of the largest bright nickel plating solutions—40,000 gallons capacity.

The metal furniture is placed on the conveyor after polishing and is nickel and chromium plated in one continuous cycle.

Industrial Lining Engineers, Inc., Edgeworth, Pa.

A much needed lining for hot water tanks as well as lining for tanks for acid dips, pickling, plating or several other purposes. Racks can be coated with the same materials which consist of the newly developed resisting compounds.

This company specializes in tank linings and rack coatings exclusively and has a comprehensive line for every type of tank or rack.

A novel development is the repairing of ruptured coatings with the aid of a soldering copper. To "solder" plastics is a new development and the proof was demonstrated to all interested—and who wasn't.

Pleadwell Engineering Company, Buffalo, N. Y.

The hexagonal cylinder for barrel plating units are so universally used that it was quite an innovation to have demonstrated the "Pleadwell Bulk Plater." A most unique design that will prove a valuable unit for plating small parts in bulk. The "open faced" cylinder oscillates in a manner to give a more direct "tumbling" of the parts to be plated than the rotating motion. The anodes can be placed in a container directly above the work, which overcomes the resistance of any diaphragm and brings the anode closer to the work. The construction is sturdy and the unit should prove very efficient. This is the first equipment offered the plating trade that combines the features of both the rotating cylinder annd the oblique plating barrel.

J. J. Siefen Company, Detroit, Mich.

The spraying of buffing compositions that is at present receiving so much attention is, according to this company, a development in which they have been successful for several years.

The type of spray guns exhibited appeared to be efficient and gave the promise of a long life in commercial use.

Methods have been developed and several installations are in use where *Nuglu*, a product made by this concern is applied through an airgun. A system has been devised in which the air and the fluid lines are connected, through which method many of the handicaps of the process of spraying such mixtures as liquid buffing compounds are overcome.

Spraying buffing compounds simplifies the application to the buff wheel, which results in a distinct economy.

The Sturgis Products Co., Sturgis, Mich.

Roto Finish

A miniature model was displayed of the unit employed in Britehoning process for finishing die castings, stampings and machine parts. The complete unit was made of a transparent plastic.

Samples of the materials used to Britehone work which were developed and patented by the Sturgis engineers as well as work that had been processed was on exhibit. The engineers made every effort to answer all the many inquiries and from the number of visitors it was evident that they were successful.

In addition to the above firms a number of others maintained open houses for discussion of materials and methods relating to electroplating and allied subjects. Among these were:

Egyptian Lacquer Mfg. Company New York, N. Y.

The *Enthone Company* New Haven, Conn.

The *Harshaw Chemical Company*, Cleveland, Ohio.

Maas & Waldstein Company, New York, N. Y.

The *Pennsylvania Salt Mfg. Company*, Philadelphia, Pa.

Oakite Products, Inc., New York, N. Y.

Special Chemicals Corp., New York, N. Y.

Frederick B. Stevens Company, Detroit, Mich.

The *Udylite Corporation*, Detroit, Mich.

There no doubt were others that time did not permit visiting. In future conventions there should be a bulletin board for all the companies having displays so that those attending can arrange a schedule to see what is new in the electroplating industry.

Abstracts of Papers Presented at Educational Sessions

Wartime Plating Developments In England

By A. W. Hothersall
Woolwich Arsenal, England

The developments can be grouped under three main headings: (1) Protective coatings (including the properties of deposits, methods of testing and specifications); (2) Engineering applications; (3) Miscellaneous applications.

1. (a) Brass plating of steel cartridge cases and its use as a coating on steel for rubber adhesion.

(b) An investigation of the structure and properties of chromium deposited from a standard chromic acid bath. Current densities ranged from 50 to 3000 amp. per sq. ft. The most lustrous deposits were always the hardest.

(c) Speculum plating, the deposition of an alloy of copper and tin from an alkaline stannate bath containing copper cyanide. Separate anodes of copper and tin are employed. The plate is a pleasing white, not unlike that of silver and is easily polished to a brilliant lustre.

(d) Another development fostered by the Tin Research Institute is the electroplating of tin-zinc alloys. The corrosion resisting properties of this type of plate compare with electrodeposits of cadmium, tin and zinc. Steel plated with deposit of this composition did not rust at the pores of the plate under salt conditions or humid conditions in the absence of salt.

(e) A method of tin plating steel sheets was developed but never carried beyond the pilot plant scale.

(f) Zinc plating from sodium zincate bath to a thickness of 0.0003 inch in 12 minutes.

(g) Application of a chromate film on zinc plate by a short dip in a solution of dichromate and sulphuric acid.

(h) An investigation of adhesion test methods. The conclusion reached was that it was only possible to propose a universal test. The instrument proposed carried a vibrating hammer which was applied to a local area of the coating.

(i) A method for a drop test for obtaining thickness of decorative chromium deposits.

(j) the jet test was investigated for electrodeposits of silver and zinc.

(k) A simple form of a magnetic test for non-magnetic coatings on steel has been developed.

(l) The use of electrodeposition as a means of building up worn or over-machined surfaces. Many new plants were installed. The two metals chiefly deposited were nickel and chromium.

(m) Electroplating bearings with lead, silver, tin and indium was practised to a greater extent than before the war.

(n) Cracked castings were repaired by electrodeposition.

(o) A method for making powdered copper by electrodeposition from acid sulphate solutions.

(p) Electrolytic polishing was used for certain purposes.

(q) Attempts to develop electroforming

moulds for die castings, plastics, etc., a process that is unlikely to assume any great importance.

Summary of Wartime Research on Plating at the National Bureau of Standards

By Dr. William Blum
National Bureau of Standards

The use of electrodeposited silver-lead-indium coatings, the application of "porous" chromium to cylinders and piston rings and the use of nickel coatings for the Manhattan Project were those that were given general attention.

The Bureau cooperated with NDRC in the development of chromium plating the bore of high velocity rapid-fire guns.

Exploratory tests were made of protective coatings for steel cartridge cases. The most promising coatings were zinc and a baked phenolic varnish.

A study was made of the deposition of manganese on brass primer cups.

There were 2,000 "Magne-gages" calibrated by the Bureau.

The saving of over 5,000,000 pounds of copper compensated for the inconvenience caused by zinc plated steel one cent piece.

Purification of Rhodium Plating Solutions

By Abner Brenner and Walter A. Olson
National Bureau of Standards

Some rhodium plating solutions used in the Government service began to yield dull deposits and these were investigated to restore brightness. Most impurities such as zinc., iron, cadmium, nickel, cobalt, silver, mercury, and lead, in acid rhodium solutions can be precipitated by potassium ferrocyanide.

(NOTE: A patent has been granted on June 4th. This is assigned to the U. S. Government.)

Deposition of Nickel by Chemical Reduction

By Abner Brenner and Grace Riddell
National Bureau of Standards

A process was developed for the production of adherent nickel deposits of good properties by an immersion process. The method used was a hot ammonical solution of a nickel salt with hypophosphites.

Bath	1 *g./l.*	2 *g./l.*	3 *g./l.*
Nickel chloride, $NiCl_2.6H_2O$	30	30	30
Sodium hypophosphite, NaH_2PO_2	10	10	10
Ammonium chloride, NH_4Cl	50	50	50
Sodium citrate, $Na_4C_6H_5O_7{\cdot}5\frac{1}{2}H_2O$	100	..	100
Rate of deposition mm/hr.	0.006	0.012	0.005
in/hr.	0.00025	0.0005	0.0002
Appearance of deposit	Semi-bright	Dull	Bright
Alkali for neutralizing bath	NH_4OH	NH_4OH	NaOH
pH	8-9	8-9	8-9

Temperature 90° C. (194° F.).

X-Ray Diffraction Studies of Electrodeposits

By Theodore Voyda
Pratt-Whitney Aircraft Co.

While the subject of X-Ray diffraction is not well understood by many platers, its value in the solution of certain problems must not be overlooked. Deposits for aircraft bearings was studied. This was used due to the non-destructive nature of the method. A thin surface layer can be studied without serious interference from subsurface layers.

The indium layer was found to diffuse rapidly even at room temperature. Indium content of the lead gradually decreases to small percentage of original total if heating is prolonged. In specimens heated for long periods the undercoating of silver was found to contain a high indium concentration.

Considerable work was done on methods of producing good bond of plated metal to the basis metal. The X-Ray assisted in determining causes of poor bonding.

Three types of bonding were observed.

1. Mechanical.
2. Solid solution or intermetallic type.
3. Pseudobasal isomorphic type.

X-Ray diffraction proved advantageous in the investigation of electrodeposited alloys.

Electropolishing—What Is Its Status Today?

By Charles L. Faust
Battelle Memorial Institute

Electropolishing is now a commercial process for surfacing, machining, or finishing metals, either to provide a brilliant surface appearance, or to achieve machining without cold working or heat effects, and the attendant distortions that accompany metal-finishing methods.

At the present time, evaluation of practical application generally originates from a desire to replace hand polishing and buffing. This attempt too frequently fails because proper considerations have not gone into the thinking. One must recognize and immediately accept the fact that there is no "*electrolytic wheel finish.*"

Electropolishing can be accomplished only by metal removal which consumes chemicals. Costs are based on direct charges such as for plating costs. There is no reason to believe that electropolishing will displace mechanical polishing and buffing.

Chromium, bright nickel, bright copper and other metals can be electrodeposited, using commercial methods immediately after the rinse following electropolishing.

No successful methods for electropolishing wrought iron or cast iron have come to the author's attention.

Wrought and cast copper are made very lustrous. Oxides present are troublesome and lead to pits or "peaks." Electropolished copper can receive "Electrocolor" with rich color effects not obtained on wheel-buffed copper.

All compositions of copper-zinc alloy can be electropolished but best results are had with cartridge brass and gilding metal.

Monel and nickel silver are polished with commercial facility in sulphuric acid. Mirror-like finishes of exceptional light reflectivity are commercially produced on aluminum, which also acquires an unusually rich tone when anodized and dyed.

No commercial electropolishing of zinc and zinc die castings is at present known.

Cadmium can be electropolished in acid solutions which are under development.

Lead, tin and their alloys are electropolished in perchloric-acetic acid solution for metallographic examination.

Promising results have been obtained for barrel polishing copper plate on parts which are barrel plated.

Materials are consumed during electropolishing. Metal is removed from the work, generally equivalent to 0.0001" to 0.001" in thickness and must be removed from the bath. Thus, life of an electropolishing solution is one element of cost that must be considered.

The cost of chemicals, the current density range, the tank voltage, the stability of the bath, the breadth of applicability, etc., determine whether electropolishing process will be economical.

The important conclusion is that electropolishing application must be "tailor fit," therefore, costs must be specifically evaluated for each case.

Corronizing Wire Screen Cloth Using Radiant Heating

By J. Edward Bermiller[1] and Damon C. Antel[2]

[1] *Hanover Wire Cloth Co.*
[2] *Formerly Standard Steel Spring Co.*

Screen cloth is woven from cold drawn carbon steel wire in rolls averaging 900 feet in length.

The present Corronizing unit is made up of two plating lines, one for nickel plating, the other for zinc plating and alloying. All plated cloth is handled with clean white gloves to prevent finger marking.

Typical composition of bath are:

Nickel

Nickel metal	8.8 oz./gal.
Nickel sulphate	36.0 "
Nickel chloride	3.3 "
Boric acid	3.0 "
pH (electrometric)	2.5-4.0
Temperature	120° F.
Amps./sq. ft.	12.3-18.7
Thickness of coating	0.000075 in.

Zinc

Zinc metal	13.4 oz./gal.

Zinc sulphate	59.0 oz./gal.
Zinc chloride	3.0 "
pH (electrometric)	2.2-3.5
Amps./sq. ft.	24.0
Time of plating	5.6 min.

After plating and finishing, the wire cloth passes into the radiant burner oven for alloying. The temperature is 750°-800° F. The resulting gamma alloy consists of 20% nickel and 80% zinc with a total thickness of 0.00015 to 0.00016 inches. There remains a base of about 0.000045 inches of residual nickel not alloyed with the zinc.

Some Observations on Alkaline Electrotinning

By T. G. Timby

Jones & Laughlin Steel Corporation

All tin plate manufacturers have, at times, been made aware of a difference in corrosion resistance between two apparently comparable lots of plates but no one as yet appears to have arrived at the final answer. The economic future of electrolytic tin plate will depend in no small degree on the solution of this problem.

Certain indirect tests suggest that if plate of mediocre corrosion resistance had not been rather heavily pickled prior to tinning its corrosion resistance would have been brought up to a satisfactory level. A variation in heat treatment has been tried. The normalized stock was by far better in corrosion resistance.

The alkaline solutions deposit tin preferably from the stannate form. Theoretically, twice as much tin per ampere hour may be deposited. An addition agent that would permit satisfactory deposits from an alkaline stannite solution might have interesting possibilities.

The earliest investigational work was with the sodium solution; the potassium solution entered into the production of tin plate in the beginning of 1943.

Solution control has been found to be largely a matter of maintaining that concentration of free caustic which accumulated experience has shown gives the most generally satisfactory operating conditions. If the free caustic content is held at about 30 to 35 g. per liter, the tin will more or less take care of itself and the equilibrium range appears to be around 45 to 55 g. per liter; this at operating temperature range between 190° and 200° F.

Anode design has an important bearing on anode behavior. An ideal anode should have the following characteristics:

(a) Maintain a fairly uniform area during its useful life.

(b) Permit operating control of the filming operation.

(c) Give as uniform current distribution as possible.

(d) Give uniform coating distribution on the strip.

Tin Plating of Strip Steel at High Speed

By G. C. Jenison and S. S. Johnston

Weirton Steel Company

In 1938, the Weirton Steel Company, with Hanson-Van Winkle-Munning Company and United Engineering and Foundry Company, installed a pilot plating line in the Weirton, W. Va., Tin-Mill of the Weirton Steel Co.

The strip was plated first on the bottom and then on the top and after a thorough wash the matte finish was brought to a high lustre by touching it with high-speed revolving brushes made of nickel silver wire.

The basic design specifications laid down for commercial lines included:

1. Speed 1000 ft./min.
2. Maximum band width—38 inches.
3. Gauge 0.008"-0.035".
4. Coating weight—0.5 pounds tin/base box (0.00003" per side) at 225 amps/sq. ft.
5. The uncoiling and recoiling reels should handle coils weighing up to 30,000 lbs. each.

In the electrolytic cleaner the cleaning is alternately cathodic and anodic. The electrolyte, any of the commonly known alkaline cleaners, and the strip itself, complete the circuit without any electrical contacts. Current density is about 100 to 150 amps./sq. ft. Wringer rolls return the excess drag out to the tank.

The strip passes into the pickler; a solution of 4 to 8% by weight of sulphuric acid operated at a temperature of 180° to 190° F.

After thorough rinsing the strip enters the first deck of the plater. The plater, about 80 feet long has three main decks. In each of the first two decks there are 12 plating cells, each cell being connected to a 5,000 ampere, 12 volt generator. A 15,000 gallon storage tank for electrolyte is under the first deck and pumps are continually supplying fresh electrolyte to each cell.

The anodes supports are slanted for movement of the anodes after corrosion and they maintain an anode-cathode spacing, which decreases in the direction of the movement of the anodes. About 75% to 80% of the anode is plated away. They are of pure tin and 30" long and about 3" x 3". To increase anode area and reduce anode current density, they are cast with an offset in one side.

The plated strip is sprayed by solution from the drag-out recovery tank and wrung, then passes to the third deck and into the drag-out recovery tank. The recovery tank is slightly acidified with sodium-bifluoride to prevent hydrolysis of stannous tin.

After thorough washing the plate is dried and then goes into an operation variously described as fusion, melting or flow brightening. To accomplish this, the strip passes through a high frequency, inductive field. The frequency is 200,000 cycles at 17,000 volts and the power input is electronically controlled so that the tin is just melted but not burned or over-oxidized.

The strip after cooling is given a chemical treatment in an alkaline chromate solution after which it is rinsed, dried and given a coating of oil. The strip is then rewound into a plated coil and is ready to be sheared into required sizes.

Examination of Electro-Cleaned Steel by the Electron Diffraction Technique

By C. W. Smith[1] and I. L. Karle[2]

[1] *Detrex Corporation*

[2] *University of Michigan, Ann Arbor, Mich.*

Electrocleaning is commonly believed to produce a chemically clean surface upon which a satisfactory electrodeposit can be obtained. Electron diffraction examination shows that actually, this surface is filmed with some compound of the base metal, usually an oxide or some combination of elements present in the cleaning solution.

Adhesion of electrodeposits depends upon the thickness of the inter-surface film. The force of adhesion between the electrodeposit and the base metal decreases as the square of the distance separating the metal and the electrodeposit.

In this investigation the composition of the steel, the time of treatment, the temperature and the current density were constant. The solution composition and electrodes were made variable.

The "clean" steel surfaces cleaned electrolytically never existed. Formation of films on steel as the result of electrolytic cleaning are shown by electron diffraction examination as only the surface film will diffract the electrons.

Disposing of Plating Room Waste Liquors In Compliance With Stream Pollution Laws

By C. J. Lewis

Warner Company

Stream pollution is of interest to the electroplating industry because of plating room wastes. These wastes fall under the general headings of acids, alkalies, cyanides and heavy metals. All of these materials are potentially objectionable under the present stream pollution laws of various states.

As a general rule, stream pollution laws are applicable to the discharge of objectionable material rather than to its production or cause.

Because of the enormously high toxicity of cyanides, to aquatic life in particular; because of the biochemical difficulties caused by small amounts of cyanide, chromate and iron it is very likely that even modest quantities of plating room wastes will require at least some form of chemical treatment prior to discharge. The electroplating industry should take cognizance of what other industries are doing about stream pollution.

Because of the economic possibilities of some of the elements and compounds they contain, plating room wastes are, and have been investigated for by-product recovery. A cooperative project would study not only the methods of waste disposal, but also interpret the legal aspects and render direct service to individual establishments. Considering the thousands of electroplating units throughout the nation it seems fitting to suggest that an annual average contribution of five dollars would be sufficient for sustaining an adequate research program.

Acids and alkalis respond to relatively simple waste treatment procedures. Chromium creates somewhat of a special problem. Lime or a comparable alkali treatment of combined plating room wastes appears to offer the most promising possibility.

Recovery of valuable by-products may result in profit or even partially offset the cost of treatment.

The Effect of Surface Preparation on the Durability of Organic Coatings

By V. M. Darsey

Parker Rust Proof Corporation

Extensive use of government specified paints of known composition in recent years has focused attention on proper metal preparation so that finish performance cannot be blamed on paint quality. The most widely used methods of preparing metals for painting may be classified as:

1. Methods which do not materially change the surface characteristics of the metal.
2. Methods which mechanically or chemically alter the surface characteristics of the metal.
3. Methods which convert surfaces to a non-metallic coating adapted to inhibiting corrosion and increasing the adhesion of applied organic finishes.

Group 1 includes various types of alkali, emulsion or organic solvent cleaning.

Group 2 includes mechanical methods of preparation such as sand or shot blasting and such methods as ordinary acid pickling and others involving the use of phosphoric acid and a grease solvent to clean and roughen the surface to provide better adhesion of applied finishes.

Group 3 includes those methods which convert metallic surface to a non-metallic coating which inhibits corrosion and increases the adhesion and resultant durability of applied organic coatings.

When it is desired to test a given procedure for metal preparation for cleanliness and suitability for painting, perhaps no method serves the purpose better than immersing the painted article in water for 24 to 48 hours which is usually sufficient to reveal blistering. This test, however, will not indicate the presence of traces of oil or grease which can usually be detected by an adhesion test such as the familiar knife test.

Cold rolled steel panels (SAE 1020) were prepared by:

1. Solvent cleaning (trichlorethylene).
2. Phosphoric acid cleaning (15% H_3PO_4) plus organic solvent.
3. Phosphate coated, paint base type (Bonderizing).
4. Phosphate coated, corrosion preventive type (Parkerizing).

All panels after treatment and without painting were exposed in a rural atmosphere for 19 months at Morenci, Michigan, at 45° facing south. Little difference was shown in the corrosion rate between solvent and phosphoric acid cleaned steel, whereas corrosion was reduced 50% and 75% respectively by the paint base and corrosion preventative type phosphate coating.

Because of difficulty in obtaining adequate adhesion of paint finishes to copper, brass and lead, they are sometimes chemically treated to convert their surfaces to an oxalate (Loxal) coating.

Many manufacturers convert zinc surfaces to a water insoluble crystalline phosphate coating which inhibits corrosion and prevents reaction of the paint vehicle with the metal. Steel is now available with electroplated zinc approximately 0.00002″ to 0.00005″ thickness with the surface converted to a phosphate coating.

A recent development consists in conversion of aluminum alloy surfaces to an insoluble phosphate coating which effectively increases adhesion of applied paint finishes. This treatment permits the use of a wide variety of paints which cannot be used effectively over untreated aluminum.

A Strippable Spray Type Coating

By E. H. Bucy

Zapon Division, Atlas Powder Co.

A new development which has been held under a secrecy restriction by the Navy may now be discussed freely and an attempt made to evaluate its qualities for a wide variety of peace-time applications. This is, the protective coating designated by the Navy as: "Coating, Strippable, Spray Type Navy Spec. OS-3602."

This material was developed not only for obtaining protection from corrosion but also for ease of so-called "depreservation." For example, an item originally packed, let us say, in cosmoline or grease type medium would require additional packing in paper followed by a dip coat of microcrystalline wax for handling. Then before the piece or part could be used, it would require solvent cleaning to remove the grease. This added time and the stock of solvent for cleaning. Ordinarily it would take about 60 man hours to depreserve a 40 mm. gun packed under specification methods for storage and shipment. With the new type coating it took about six minutes.

The equipment or machinery is prepared for this new material which is sprayed on with an air pressure of 50 to 60 pounds in the line and 10 pounds on material. The object being sprayed is enveloped by a covering of interlocked and overlapping plastic threads. This covering follows the shape and contour of the object. It will dry in 30 to 60 minutes.

The film forming operation is then added. This solution is applied from a spray gun. Application of three coats will result in a film thickness of 0.030″ to 0.040″. A different color dye is added to each coat.

Although this coating does not have adhesion to any metal surfaces with which it comes in contact, it is formulated with rust inhibiting oils which are exuded on drying, and thus protects contact surfaces from corrosion. The film itself has a tensile strength of 2,000 pounds per square inch and 250 per cent elongation and will withstand temperatures from 160° to —40° F. for all practical purposes. Tests indicate that a normal life of the coating of five years is to be expected.

Natural and Synthetic Rubber in the Electroplating Field

By N. C. Klein

Goodrich Rubber Company

In spite of the vital importance of plating during the war natural rubber for lining equipment was prohibited. This order brought to the front plastic rubber-like materials such as Koroseal.

The majority of linings supplied for muriatic acid were of the flexible hard type. With weak sulphuric acid there was no particular problem, even as far as the soft grades of synthetic rubbers were concerned.

Plastic linings such as vinyl base and known by trade names as Koroseal, Saran and Vinylite are not synthetic rubbers, but are plastic rubber-like materials. They are applied as linings inside of plating tanks in their finished form, that is, they are not vulcanized after the lining is applied.

These materials have excellent chemical resistance, and can be recommended for temperatures up to 150° F.

The principle advantages of Koroseal and such materials is the ease of making field repairs, its extremely low absorption of plating solutions and the fact that the tanks when washed out, look much cleaner than does a piece of rubber-lined equipment.

As far as tank lining constructions are concerned, natural rubber is still our most versatile material and it is only reasonable that we have gone back to it.

Resins of the Vinyl Family In Metal Finishing

By F. L. Scott

Organic Division, United Chromium, Inc.

Synthetic resins and plastics may be divided into four general classifications: the thermosetting resins, the kind that permanently "set" once heated; thermo plastic resins, the kind that vary in hardness and plasticity with varying temperatures; the cellulose derivatives; and the elastometric or rubber type resins. Each of these classifications is of interest to the plating industry in one respect or another.

The thermo setting resins such as phenol, urea and melamine formaldehydes, and the cellulose derivatives, such as cellulose acetate, find their greatest application in metal finishing as decorative and protective finishes.

Vinyl chloride, styrene and vinylidene chloride polymers have the most outstanding chemical resistance of the vinyl family.

The use of resins in the metal finishing industry can be divided into the following classes: (1) the functional use of resins as an aid in electroplating metals; (2) the protective use of resins as maintenance coatings for equipment, and (3) the decorative and protective use of resins as coatings for finished or plated articles.

To make an effective rack coating the resins must be formulated into a coating material that will withstand all the acid and alkaline solutions under conditions of use; namely, cathodic and anodic potentials, high and low temperatures, and all types of corrosive chemicals. In addition, the coating must possess excellent electrical insulation properties, be shock resistant to withstand rapid and repeated temperature changes, and be tough and resilient to withstand the normal abuse to which most racks are subjected.

A stop-off coating must have the same degree of chemical resistance as a rack insulation coating. In addition, it must adhere firmly to highly polished as well as rough surfaces.

Tank linings are usually formulated for specific purposes: that is, a lining may be required to resist only acid solutions, or oxidizing solutions, or alkaline solutions. These less severe requirements are overshadowed, however, by the fact that tank linings are in continuous contact with these chemicals and are required to give good

service for a period of years.

Shields and insulating blocks must also have high chemical resistance to a wide range of corrosive solutions.

It must be emphasized that the resins must also be considered with respect to the contamination of the plating solution by the decomposition products of the resins or materials used to formulate the resins into a coating material. Such contamination will lead to the poisoning of the plating bath with many and serious harmful effects.

As product finishes, the general purpose organic coatings for fabricated metal and plated articles is three-fold: (1) finishes applied solely as decorative coatings either to impart color or to hide defects; (2) finishes applied as permanent protective coatings against specific corrosive conditions but having at the same time a high degree of "eye appeal" (3) temporary finishes applied as protection against corrosive conditions and mechanical abrasion during plant handling, storage and shipments.

Coatings for food containers and bottle caps must be non-toxic-free from odor and taste, resistant to alcohol and water. Often the coating is applied before fabrication and, therefore, must withstand stamping, deep drawing, crimping, edge rolling and threading without being ruptured.

Vinyl coatings serve in all of these product finish applications.

Characteristics of Certain Plastic Films and Coatings

By J. K. Shackleton

E. I. du Pont de Nemours & Company

Polythene is an abbreviated name for polyethylene, the product produced by polymerizing ethylene gas under carefully controlled conditions. The polymer comes from the converter as a white powder which may be used as such, or changed to some other more easily workable form.

When compacted, and recut to the proper granular size, the plastic may be molded, or extruded, yielding a large variety of shapes such as sheets, tubes and rods of various dimensions.

The application of polythene to surfaces as an inert, impervious, protective coat may be accomplished in several ways. Polythene is soluble in a small number of organic solvents. Chief among these are chlorinated hydrocarbons such as trichlorethylene, carbon tetrachloride and chlorobenzene xylene, toluene and a few other hydrocarbons also serve as useful solvents for this polymer.

To the electroplating industry one of the most promising formulations of polythene is a water emulsion which has just been developed and is now being evaluated.

Polythene is not dissolved by any known solvent at room temperature. Only a very few have any noticeable effect upon it. It is not attacked by concentrated mineral acids, including hydrofluoric, or by caustic solutions. It is particularly resistant to inorganic chemicals of all kinds. Its resistance to oxidizing and reducing agents in general is remarkable.

At elevated temperatures polythene is very resistant to chromic acid, to hydrochloric acid in all concentrations, and to caustic solutions. Concentrated nitric or sulfuric acid at 100° C. will oxidize and clear the resin.

Polythene is free from any odor or taste and is completely non-toxic. It has extremely high impact strength. The electrical properties are outstanding.

It is expected that where large production facilities are in operation polythene will be competitive in price with many of the less expensive plastics.

"Lucite," acrylic sheets, rods and tubes have been used as insulators for various parts in electroplating tanks. It has been used for lining tumbling barrels for electroplating processes. Plating barrels have been in continuous service for two years.

Plating With a Bivalent Copper Bath

By George Schore

The most common type of plating solution with bivalent copper salts is the acid copper bath—the essentials of which are copper sulphate and sulphuric acid. Its composition can be varied over an extremely wide range.

The factors which directly control the concentration of the copper ions at the cathode are:—

1. Composition of the solution.
2. Temperature of the solution, up to 130°F.
3. The current density.
4. The agitation or movement of the solution and its relation to the cathode since this will supply fresh copper ions to the cathode.

The difficulties are mainly two types:—

1. The unequal distribution of current which will cause a more rapid growth of deposit towards the edges of the cathode and to high spots on the cathode due to its shape.
2. The growth of nodules or "treeing" on the surface of the deposit.

These phenomena are particularly marked in a solution which is free from addition agents. In the presence of addition agents such as phenol-sulphonic acid, however, agitation does not have this tendency.

Growths of copper at the edges can be reduced by using a screen of insulating materials. If the following precautions are taken, the tendency to growths or nodules may be greatly reduced. Rolled anodes which are not bagged should be used; the solution itself should be constantly filtered; a highly conductive solution should be used and the temperature should be maintained between 75° and 130°F.

It appears that the most satisfactory form of agitation is by rotation of the cathode. Movement of the liquid in the baths may be effected by paddles or by circulation of the solution.

Addition agents may be either organic or inorganic chemicals such as:—

1. Organic addition agents—peptone, gelatin, dextrin, phenol, glue, alcohol, etc.
2. Inorganic addition agents:—nitric acid, aluminum sulphate, sodium chloride, tin-chloride etc.

Ollard found that hard copper deposits are generally caused by the introduction into the solution of an organic reagent. Brittle deposits are caused by organic agents, and also excessive current density. When the copper is too soft it is generally caused by too low a concentration of sulphuric acid or an excessive temperature of the bath. When the copper is rough it is generally caused by dirt in the solution which may be removed by filtration.

A Periodic Chart for Electroplaters

By George Dubpernell

United Chromium, Inc.

The discovery of metallic elements which can be electrodeposited from aqueous solutions was briefly reviewed by Dr. William Blum and discussed. A periodic chart of the elements was presented for a better knowledge about the electrodeposition of metals. The similarity of the best solutions to use for metals near each other on the chart was shown. A general statement was made in connection with the ease or the difficulty of electrodeposition, electrode potential, physical properties, structure of deposits, current efficiency and other phases of solution operation.

While a student at Columbia University, under Dr. Colin G. Fink the Bohr-Thomson periodic chart came to the author's attention. The close correlation between the metals which can be electrodeposited from aqueous solutions was noted. From a study of this chart a new one was developed which is offered for further investigation.

Note—To obtain a clear understanding of this valuable contribution to electroplating research it is necessary to study the chart which it is hoped will be available for publication in the near future.

Manodyzing and Dye Coloring Magnesium Alloys

By Paul R. Cutter

Hanson-Van Winkle-Munning Company

Modern designers have been aware of the desirable properties of magnesium alloys for some time, but in many cases have hesitated to use it for the lack of a more suitable finish.

There are perhaps four major limitations that a finish for magnesium alloys must overcome:

1. Protect the metal from the attack of chlorides or other corrosive environments.
2. Produce a slightly acid non-metallic surface to dominate the tendency of the metal to develop alkalinity, thus insuring a good paint base.
3. Protect the relatively soft metal from wear and abrasion.
4. Insulate the magnesium alloy parts from galvanic corrosion attack or their tendency to develop a couple when brought in contact with dissimilar metal.

The chrome-pickle and the acid dichromate processes which in the past have been relied upon as satisfactory finishes, have proved sufficient to overcome the first two short-comings, but have offered little in correcting the remaining deficiencies. The Manodyz Process is an electrolytic method which forms a highly protective and decorative magnesium-oxide-silicate film on the surface of magnesium alloys.

After the magnesium parts are thoroughly

(*Concluded on page* 302)

Developments in Silver Plating
A Review of Recent Trends

By PHILIP J. LO PRESTI

Sylvania Electrical Products

Discussion

THE purpose of this paper is to provide some information that will enable one to produce good silver plating more consistently. In order to produce good silver plating more consistently it is necessary to control all the variables connected with the process that are possible to control. Any step in the preparation of the article to be plated can vary and consequently could be called a variable.

This paper will not attempt to cover all the variables in the silver plating process but will limit itself to some of those occuring in the silver plating solution. The variables that will be discussed in this paper are as follows:—

A. Chemical Composition Variables
   1. Components of the solution
      (a) Silver cyanide
      (b) Free potassium cyanide
      (c) Potassium carbonate
      (d) Brightener
   2. Impurities
      (a) Organic decomposition products
      (b) Lead
      (c) Copper
      (d) Iron
      (e) Silicon

B. Physical Variables
   1. Temperature of solution
   2. Degree of agitation

In order to evaluate the effect of the foregoing variables we are interested in knowing what they do to our product. A method of evaluating these variables is to determine their effect on the following physical properties of the silver deposit:

1. Uniformity
2. Hardness
3. Porosity
4. Brightness

Silver Cyanide as the Variable

The function of the silver cyanide content is to provide a supply of silver ions in order to obtain deposition of metallic silver at the cathode. The effect of varying the silver ion content has been reported by many investigators.

Sanigar[1] states that "it is the silver ion concentration of the solution which determines the limiting current density which can be used, under given conditions, for 100% cathode efficiency, and not as is frequently thought, the conductivity of the solution." Promisel and Egeberg[2] report that an increase in silver content is accompanied by a decrease in resistivity, a decrease in throwing power, an increase in anodic polarization, and a decrease in cathodic polarization. Wernlund in a private discussion in 1938 outlined the following formula for rapid silver plating:—

Silver cyanide	10-18 oz./gal.	75-135 g./L.
Potassium cyanide	10-18, "	75-135 "
Sodium thiosulphate	0.1 "	0.75 "
Temperature	100-120°F.	38-49°C.
Current Density	10-100 amp./sq.ft.	

Although there are more variables to be controlled than the silver cyanide in this formula, it is obvious that a high silver content is necessary in order to plate at high current densities. This statement is not entirely true if we consider Wood's[3] silver solution which has the following composition:—

Silver (as metal)	16-18 g./L.	2.0-2.3 tr. oz./gal.
Free sodium cyanide	15-22 "	2.0-3.0 av. "
Sodium carbonate (maximum)	22 "	3.0 "
Potassium nitrate	113-150 "	15-20 "

This solution is operated at 5-15 amp./sq.ft. and at a temperature from 72-78°F. (22-25½°C.).

Promisel and Wood[3] state the following in favor of (Wood's) solution: "In spite of the lower range of silver concentration specified, the current density range is at least as high as that with the higher silver concentration in the conventional bath. It has been reported to the author by E. R. Bowerman that with Wood's solution it was possible to obtain a bright silver deposit at a current density up to 300 amp./sq.ft., by using a system of rapid continuous filtration through activated carbon. In this work carbon bisulphide was used to brighten the deposit. Some additional work done in high speed silver plating must be mentioned here because of the unusually high silver cyanide content of these solutions, insofar as this is the variable being discussed.

Schaefer and Mohler[4] studied silver plating with the object of obtaining a silver solution of as high efficiency as that obtained in the copper cyanide high efficiency solution, i.e., 98-100%. They begin by stating that, "with this thought in mind the following variables were studied:—

(A) High metal content
(B) Low free cyanide
(C) Alkali hydroxide
(D) Agitation
(E) Temperature
(F) Addition Agents

The cathode, a steel shell 3½" in diameter, was rotated at 125 r.p.m. equivalent to a peripheral speed of 114 ft./min., in order to provide agitation. The plating solution was pumped through the rotating cathode at a rate of 50 gal./min. They state that this mode of agitation was standard and that the six variables listed above were studied under these conditions. Five silver solutions are listed from their large num-

ber of experimental compositions. If we examine these solutions, the silver cyanide content varies from 30 g./L. to 107 g./L. but the other ingredients all vary. Nevertheless each solution was studied separately. They arrived at a high efficiency silver solution of the following composition:

Silver Cyanide	40-43 g./L.
Free potassium cyanide	38-42 "
Potassium hydroxide	8-14 "
Temperature	42°-45°C.

A number of preliminary experiments were made as to its effect on a variable and then the peripheral speed rate of pumping were held constant. According to their discussion they obtained a dense, ductile deposit at 100 amp./sq. ft. with a silver cyanide content of only 42 g./L.

In regard to silver cyanide content Simon and Lumley,[5] conclude that the permissable current density may be increased by raising the silver content of the bath.

From a study of these papers and the author's experience it may be stated that it is possible to increase the permissable current density used in a silver solution by raising the potassium silver cyanide content.

Free Cyanide

The function of the free cyanide is to provide an amount of potassium cyanide (above that which is necessary to form the complex potassium silver cyanide, $KAg(CN)_2$ ions) in order to dissolve silver from the anodes at a sufficient rate to replenish the solution. Blum and Hogaboom [6] explain the reduction of the silver ion concentration by an increase in free cyanide. This principle is used in the operation of the silver strike solution, where a high free cyanide content is used to reduce the silver ion concentration in order to prevent immersion deposition of silver. The effect of varying the free potassium cyanide has been reported by Promisel and Egeberg,[2] who state that "an increase in free cyanide is accompanied by an increase in throwing power, a slight increase in cathodic polarization and a decrease in anode polarization."

Simon and Lumley [5] report that it is possible to increase the permissible current density and produce adherent deposits by an increase in free cyanide.

Helmle [7] reports an increase in brightness in Wood's silver solution by increasing free cyanide and temperature.

Schaefer and Mohler,[4] report that, in their silver bath #2, a low free cyanide was found to be beneficial to the formation of a smooth deposit.

It is well known that carbon bisulphide is commonly used as a brightener in silver plating. The usual method of making an addition is definitely a hit or miss affair. The brightness of the deposit will vary even with careful additions. With this thought in mind the author has developed a method of bright silver plating that does not require the use of an added brightener. Essentially the plating process is a system using continuous filtration through activated carbon. A further advantage in not using a brightener is that it eliminates another source for obtaining impurities in the deposit. It can safely be concluded that brighteners often are objectionable and unnecessary in silver plating.

Impurities

Some of the impurities found in a silver solution are organic decomposition products of potassium cyanide, brighteners, copper, lead and iron. Insofar as plating for decorative purposes, it is possible to obtain a semi-bright silver deposit with a large variety of impurities in the solution. The author has produced good silver deposits from a silver solution that contained leaves, chewing gum and dance tickets. In fact, this solution was also used for plating evaporating masks to tolerances of only a few microns. The company for whom this work was being done purchased ten gallons of this solution because it produced an excellent silver deposit. However, the author does not recommend that the foregoing impurities be added to a silver solution inasmuch as the object of this paper is to stress the importance of controlling variables.

Various methods of removing organic impurities from silver solutions have been proposed. Promisel and Wood,[3] advise filtration of silver solutions through diatomaceous earth to improve the deposit. Diatomaceous earths are known to be silica compounds and are soluble in alkaline solutions. This should be a good source of silica contamination. When filtration of all plating solutions became the vogue the author promptly filtered a 200 gal. silver solution through a filter packed with diatomaceous earth. The resultant silver deposit did not increase his popularity with the buffers. The author has since been advised by Wood that no difficulty with hard deposits is encountered if a highly purified diatomaceous earth is used for filtration of silver solutions.

The method of the removal of organic impurities by filtration through activated carbon has been used successfully in high speed silver plating and by the author for silver plating electronic parts. The fact that activated carbons contain silicates again brings up the question of silicon contamination that is encountered in the use of diatomaceous earths. In order to help clarify this point the following information was supplied by Helbig of the Darco Corporation.

A typical analysis of an activated carbon widely used for the purification of electroplating solutions is given below:

Carbon content	75%
Moisture	2-7%
Ash (dry basis)	25%
Water soluble matter	1%
Acid soluble matter	1.50%
pH of water extract	4.5-5.5
Mesh distribution: -100	97%
-200	88-90%
-325	70-75%
Bulk density	25 lbs./cu. ft.

The ash content of this carbon is characteristic of the raw material from which the carbon is produced, which is lignite. The carbon, after activation and grinding, is thoroughly washed with acid to leach out extractable inorganic substances which might contaminate liquids treated with it. The acid washing is followed by careful water washing, to remove salts and excess acid. The ash which remains after this exhaustive washing consists primarily of complex insoluble silicates. A typical analysis made on the ash, fused according to standard procedure, shows the following composition:

SiO_2	65-67%
Al_2O_3	25-27%
Fe_2O_3	2-3%
CaO	2-3%
Na, K, Mg, & trace elements	Balance
Cl^- & $SO_4^=$	traces

In general, heavy metals other than iron, and poisonous elements such as arsenic, are absent.

Because the silica is bound to aluminum, iron and other

cations in complex silicates, it is so little subject to the dissolving action of alkaline solutions, that it can be used with safety for silver cyanide plating baths. There are indications that in certain other plating solutions, operated hot at very high pH levels, a small quantity of soluble silicate may be formed, and the manufacturer should be consulted for recommendations on special carbon grades in such cases.

A word should be said also about water soluble and acid soluble constituents in activated carbon. The standard procedure for determining these involves prolonged extraction with hot water or hot strong acid, so that the figures obtained are limiting figures under the most adverse conditions. It is misleading to assume that under ordinary conditions of application, all the water and/or acid extractable matter enters the solution being treated with carbon. If contamination by a particular constituent, e.g. iron, is critical, the correct procedure for investigation is to treat the solution in the laboratory with the carbon dosage to be used in the plant, using the same operating conditions such as contact time, temperature, etc. The degree of contamination is then ascertained by analysis of the solution after the carbon has been filtered off.

In regard to the removal of copper, iron and lead Stocker [8] states that, "copper can be plated out, iron in the form of ferrocyanide can be crystallized out by freezing, and lead can not be removed effectively."

Physical Variables

The effect of the physical variables, e.g., temperature and degree of agitation are more pronounced than variation in solution composition in the standard silver solution. By an increase of only a few degrees in temperature it is possible to greatly increase the permissable current density without burning the silver deposit.

Mesle[9] presents data in the 1938 Plating & Finishing Guidebook in which the permissable current density was increased from 3-5 amp./sq. ft. at 60°F. to 42 amp./sq. ft. at 100°F. without burning the silver deposit. This represents an eightfold increase in plating speed.

Simon and Lumley [5] report bright smooth silver deposits at 74°C. (175°F.) using a current density of 205 amp./sq.ft. The present author believes, however, that it would be necessary to maintain the free potassium cyanide below 1 oz./gal. (7.5 g./L.) in a silver solution operated at 74°C. (175°F.) because of the high rate of decomposition of potassium cyanide at elevated temperatures.

In order to obtain smooth bright silver deposits at a current density above 15 amp./sq. ft. from the standard potassium silver solution used in industry, agitation is practically necessary. The function of agitation is to replenish the silver ions removed near the cathode film and to remove the excess silver ions produced at the anode film. These electrode reactions are ably demonstrated by Hogaboom and Fink.[10]

Agitation can be produced by the following methods:—

1. The silver solution can be moved past the cathode with a pump and filter unit.

2. The cathode can be moved through the solution by a conveyor system, semi-automatic worm gears, and by a rocker arm cathode agitator.

3. The cathode film can be made to oscillate by superimposing high frequency alternating current and by the use of supersonic waves (15,000-200,000 vibrations per second).

Superimposed alternating current has been used to a limited degree in zinc and cadmium plating to obtain better throwing power in deeply recessed parts. The use of supersonic sound waves is still in the laboratory stage. In order to determine the amount of agitation required it is necessary to consider among other things the geometry of the article to be plated, temperature of solution, the shape of the anodes, racks, tank, heaters, and any other obstructions in the solution.

In view of the problems involved in the direct measurement of the rate of flow at all points on a cathode, it is necessary at present to be guided by the physical properties of the resulting silver deposits. It has been found through practical experience in silver plating that a combination of method one and two described previously, (combination of continuous filtration of solution and movement of cathode), will give suitable agitation and produce a smooth deposit.

In evaluating the variables that have been discussed, we are interested in their effects upon the following physical properties of the silver deposit in order to satisfy our requirements.

1. Throwing power and uniformity
2. Hardness
3. Porosity
4. Brightness

A satisfactory formula that can be used to evaluate throwing power is not easy to obtain. Correlation with cathode polarization has been attempted by Promisel and Wood,[3] who state that a high cathode polarization tends to give a good throwing power. However, if high cathode polarization is the only criterion of good throwing power, the present author has difficulty in explaining the poor throwing power of a chromium plating solution which has very high cathode polarization.

Impurities can increase the porosity and make silver deposits dull and hard to buff. With a properly designed system of agitation it may be possible to improve the uniformity of the silver deposit. A method of obtaining reproducible results is to combine the removal of organic impurities with continuous filtration, temperature control and agitation of the cathode.

Conclusions

1. It is as important to control the physical variables as the chemical component variables in order to produce high quality silver plating.

2. In order to obtain smooth, bright, and pore-free deposits it is necessary to control the organic and inorganic impurities, temperature, and degree of agitation.

3. It has been the purpose of this paper to show that it is necessary to control both chemical and physical variables in order to produce good silver plating more consistently.

References

1. Sanigar. Proc. American Electroplaters' Soc., (1930).
2. Promisel and Egeberg. Prod. Finishing, (March 1937).
3. Promisel and Wood. Trans. Electrochemical Soc., 80, Preprint 35 (1941).
4. Schaefer and Mohler. Proc. Electroplaters' Soc., (1943).
5. Simon and Lumley. Proc. Electroplaters' Soc., (1940).
6. Blum and Hogaboom. Principles of Electroplating and Electroforming. McGraw Hill Book Co., Inc., New York, p. 223 (1930).
7. Helmle. Monthly Review, American Electroplaters' Soc., (Nov. 1942).
8. Stocker. Proc. American Electroplaters' Soc., (1941).
9. Mesle. Plater's Guidebook, page 30 (1938).
10. G. B. Hogaboom, Jr. and Colin Fink. Trans. Electrochemical Soc., 57, Preprint 15 (1930).

POLISHING METHODS

By E. W. WELLS

Chas. F. L'Hommedieu & Sons Co., Los Angeles, Cal.

POLISHING of metal has been done for centuries, but not always in the distant past was it done as a preparation for the electrodeposition of another metal. In the early centuries such articles as swords, armor, jewelry and some of the household articles of nobility were polished to a high finish, but they would not pass today's standards of quality.

Briefly, the evolution of metal polishing has been extremely slow from the sandstone hand rubbing, through the foot-power polishing machine and hand burnishing, to the automatic methods of today. Like the advancement of many other things, polishing methods have followed the progress of metallurgy and manufacturing ingenuity.

A definite change in polishing came around the turn of the century with the birth of mass production. More demands were made of the electroplaters for better finishes and more production. It requires several polishers to keep sufficient work for one plater, the term "polisher" referring here to both polisher and buffer. During this period bicycles, chandeliers, stove parts, silverware and some automobile parts were moving into mass production. Some beautiful work was turned out at this time especially in polished brass, white nickel, black nickel and oxidized finishes.

The effects of metallurgy soon after this period began to be the cause of much concern in the polishing department. The automobile industry was chiefly responsible for this change. The metals had to be harder and tougher. To attain this it was necessary to alloy new metals, change procedures in forging, tempering and heat treating. The polishing wheels were glazing or throwing off the emery, causing frequent wheel changes. This slowed down production and increased wheel inventories. Instead of using the phrase that necessity is the mother of invention, I will say necessity incites the American ingenuity.

New products were put on the market and new polishing procedures were being practised. I will mention here some of the new items and practices introduced at that time which are now accepted as proper shop procedure and will elaborate later on how important each is to meet today's requirements and finishes. Some of the items were polishing wheel cement, greaseless compounds, steel buffing compounds, new types of abrasive and wheels. Among some of the new practices were wheel room temperature and humidity control, wheel setting machines, variable speed polishing lathes, compound and glue control.

Today the most important principle above all others for good polishing and buffing is the regulation of the surface feet per minute of the polishing wheel or buff. All your glue, polishing wheel cements, greaseless compounds, emery and buffing compounds are manufactured for a certain speed range. This is a direct result of the research instigated by necessity to meet the present day requirements. You can, for instance, select a tripoli manufactured by any company, put a fourteen inch sewed buff on your polishing lathe, take some brass items that you are running through your plant, place a sheet of metal or cardboard in your blower hood, then start your lathe at a slow speed and polish some of the pieces. Then increase the speed of the lathe, take out the metal or cardboard sheet from the hood and replace it with another. There will be some tripoli on the sheet taken from the hood—label this number one and keep a record of the number of pieces buffed, the number of times tripoli was applied and the time required to buff a piece. Each time the speed is increased, tabulate the results and you will find that at some certain surface feet per minute you used less tripoli and buffed more pieces. This is because the tripoli binders are made to break down at a certain friction heat and penetrate the buff. If applied below this heat it will peel off and go in the blower; if it is applied above this heat it will melt off in a liquid state which will also go in the blower and harden again from the cool air. The compound must do its work on the buff; it only clogs the blower system. Another reason is that if the speed is not correct, the compound that does get on the buff will just rub onto the piece being buffed and cause a cleaning problem in the plating room. This is not the proper method to use in selecting a competitive compound, but to show that speed regulation is necessary for economy and finish.

Because of the difference in the hardness of metals, the surface feet per minute is not always the same. For polishing stainless steel or Monel, a setup wheel should run at 9,000 surface feet per minute. For buffing, it should be 12,000 surface feet per minute. For polishing brass, it should be 6,800 surface feet per minute, and for buffing, 9,500 surface feet per minute. A difference in cut will be found in the many alloys of the metals and the speed will vary slightly to get the maximum efficiency from the wheels.

Selection of Wheels

The selection of polishing wheels for roughing, dry fining or greasing is also important. True, a grease wheel could be used for roughing but the results and efficiency would be below par. For polishing steel with irregular surfaces, a bleached muslin wheel with a medium soft density should be used at 7,500 surface feet per minute. This type of wheel allows the bonding medium to penetrate the cloth so that when the periphery of the wheel glides over the irregular shape it will not just cut the high points, but the bond will be given a better chance to hold the abrasive. The grease wheel should be a firm colored muslin cloth, sewed and cemented sheepskin, felt, walrus or bullneck. The selection of the wheel depends upon the metal to be polished and how regular the surface of the piece is. For irregular pieces the colored muslin wheel or quilted sheepskin wheel could be used on most metals. On steel the bullneck, felt or cloth

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wheel can be used. For brass the walrus, felt, or sewed and cemented sheepskin wheel. The sewed and cemented sheepskin wheel also does a fine job on aluminum. For greasing die castings, a flexible bleached muslin wheel is used, although many of the die castings today can be buffed to a satisfactory finish. It might be mentioned here, in discussing grease wheels, that the tallow should be used liberally on die castings and aluminum also. Be sure that it has the right melting point so that there is body to the grease on the wheel. These two metals have a lower melting point, and if there is not sufficient slippage between the wheel and the metal, the frictional heat will cause either a semi-melting of the metal, giving a rough, pulling effect, or may cause a melting or flow of the metal which will leave an imprint the depth of the abrasive used. On steel, stainless steel and brass, an emery cake is more suitable because it has a higher melting point and heavier body to compensate for the higher frictional heat.

The setting up of polishing wheels has been given considerable study, and the various techniques used have shown decided improvement. The manufacturers of glue, cement and abrasives have contributed much to the polishing room. Without going into the details of the opinions of glue and cement manufacturers, I believe the general practices today speak for themselves. For rough work from 36 to 120 abrasive, the cement operates more economically with better results and, from 120 to the F grades of abrasive, the glue will give better finishes. To use both in a job shop may not be satisfactory unless it has considerable rough work. The manufacturer has found that it does pay where he uses the coarser abrasives.

Heading Wheels

Glue conditions will be taken up first. Glue should be soaked between 40° and 60° F. Ground glue is soaked for at least one hour, flake glue at least six hours. It should then be heated in a water jacketed kettle to 145° F., which allows 5° for cooling to its greatest strength when exposed to the air during application. The ratio of glue and water should be checked carefully. This ratio is by weight and not by volume. For coarse abrasive it is 50%, medium abrasive 35% and fine abrasive 25%. For sizing a wheel the 25% mix is also used. A wheel drying room should be controlled by both thermostat and hygrometers, with air vents in the walls near the floor. The temperature should be 90° F. and the humidity 60%. The abrasive should be heated between 110° to 120° F., so that the glue will displace the moisture when it is bonded. This is especially true of a good grade of an alveolated abrasive. In order to condense this paper on such a broad subject, such things of importance as wheel balancing, sizing, cleaning with pumice, and using a good brush so that bristles do not lodge on the wheel will not be discussed. The cement procedure is a little different from that of glue. The cement is not heated. A sizing cement is used first which is thinner and has an ingredient in it which causes a thorough penetration into the wheel. The abrasive is heated to about 90° F. The wheel room should be heated to 130° F. with a humidity of 35%. After the first head has been dried in the wheel room it should be taken out and allowed to cool down before applying the second head, otherwise the cement applied for the second head will take a set before the abrasive has a chance to become embedded into it. To get the best results from a glue wheel it should dry at least 12 hours. A cement wheel should dry in about five hours; in both cases drying time applies only where the wheel room conditions are proper.

Greaseless compounds have been used for many things the last few years. They were originally developed to replace wire scratch brushes for obtaining a satin or butler finish. They have been used successfully for this purpose as well as for cutting down, dry fining and burring. Beside their use on all types of metal they have been used on plastics, hard rubber, wood and even by egg packers to give cold storage eggs the roughened appearance of fresh eggs. Many different types of finishes can be obtained with greaseless compounds, and would require too much time to discuss here. There are three variables used to get the required results, namely the speed, grade of compound used, and the type of buff. The speed is very important and in most cases is from 4,000 to 6,000 surface feet per minute. The greaseless compounds are made with various mesh abrasives, usually from 46 to 400 so that one of the grades selected will do the job required. The buffs that the compounds are used on range from a canvas polishing wheel to a rope or string wheel. For the average work a loose or sewed muslin buff is satisfactory, but there are many jobs that require other types to get efficiency or finish.

It has been found, especially with the new high speed bright copper and nickel solutions, that the basis metal and particularly steel, must be buffed to a higher finish before plating than was formerly necessary. Where copper and nickel used to be buffed after each respective coat there was a tendency to cover up defects of the basis metal. To get a better finish on the steel basis metal, more consideration is given to grain and wheel selection. The compounds are developed to buff out the abrasive marks and give the metal a luster required for quality work. There is another reason why a buffed steel before plating is better; that is, it gives the steel structure a new characteristic by closing the pores of the metal, giving it higher corrosion resistance qualities, so that the plated finish will last longer.

Automatic Polishing

Today, more than ever, consideration is being given to automatic polishing and buffing. This has been done successfully for a good many years but has been restricted almost exclusively to the very large manufacturers. To meet the competition of the larger concerns, the smaller manufacturers have taken up these same methods. Again we turn to the advent of the bright plating solutions, which are able to turn out the plated work faster. The bright plating solutions are not as expensive to install as automatic polishing and buffing equipment so they were put in first by the small manufacturers.

Now it is found that the polishing department cannot keep up with the capacity of the plating room. For this reason, plus the overhead of hand polishing, they are turning to automatic polishing. Every plated item is not adapted to economical automatic polishing and buffing but in many cases it has been found practical to polish part of the item automatically and the balance by hand. Many things have to be taken into account when considering an installation for automatic polishing and buffing, such as the number of pieces required in a day, if all or part of the piece can be done automatically, the present cost or anticipated cost of hand polishing and the original cost and maintenance of an automatic machine. There are many standard automatic

(*Concluded on page* 300)

Common Plating Bath Troubles

PART II

By H. J. SEDUSKY and J. B. MOHLER

Research Chemists, The Cleveland Graphite Bronze Co.

High Efficiency Sodium Cyanide Copper

TYPICAL BATH COMPOSITION[16]

	g./L.	oz./gal.
Copper cyanide	120	16
Sodium cyanide	135	18
Sodium hydroxide	30	4
Brightener	15	2
Anti-pit Agent	1.5	0.2

DULL REDDISH DEPOSITS

A high free cyanide content will cause this condition in the higher current density areas and, low brightener and anti-pit agent contents, high carbonate content and too slow cathode agitation may also be contributing factors. Low free cyanide content will tend to shift the bright plating range toward the higher current density area while low caustic content will result in a narrow bright plating range at low current density areas.

PITTED DEPOSITS

Pitting occurs in high current density areas when the anti-pit agent content is low.

WATER BREAKS

High anti-pit agent content causes water-breaks.

DARK SMUTTY DEPOSITS

Lead contamination which should also become apparent by a lead film on the anodes.

BRONZE TO BRASS COLOR

Zinc contamination.

MOTTLED-NON-UNIFORM DEPOSITS

Organic contamination which may be corrected by treatment with activated carbon.

POOR COVERAGE-PEELING

Chromium contamination which may be corrected by reducing the hexavalent chromium to trivalent chromium with sodium hydrosulfite.

POLARIZED ANODES

Too high an anode current density causes the anodes to polarize with a black insoluble film of copper oxide while too low a current density results in the formation of a loose sludge which tends to roughen the cathode. Operation at low temperatures also causes anode polarization.

High Efficiency Potassium Copper Cyanide

TYPICAL BATH COMPOSITION [26]

	g./L.	oz./gal.
Copper cyanide	56	7.5
Free potassium cyanide	3.8	0.5
Potassium hydroxide	41	5.5
Anti-pit agent		0.3 fl. oz./gal.

The high efficiency copper cyanide baths, known as high speed copper, will plate brighter deposits than the rochelle bath and bath control is not so critical since both the anode and the cathode efficiencies are one hundred percent. The plating rate is high, and smooth, bright depositis may be obtained up to 0.002 inch in thickness. The principal disadvantages of these baths are that a copper strike must be used to prevent immersion plating and the cathode must be moved relative to the solution during plating.

The potassium bath can be operated at a lower metal content than the sodium bath and with less bath decomposition.

DULL DEPOSITS

Dull deposits from this bath are regarded as those that have the typical color of a rochelle bath.

1. *High Current Density*: Do not exceed 60 amperes per square foot. If higher current densities are required use a higher metal content.
2. *High Free Cyanide*
3. *Low Temperature*
4. *Low Cathode Movement Rates*: Cathode movement may be supplemented by solution agitation if continuous filtration is used.

BURNT DEPOSITS

In general the conditions that cause dull deposits will cause burnt deposits if carried to an extreme.

ROUGH DEPOSITS

1. *Suspended Material in Bath.*
2. *Sludge From Anode*: Use electrolytic copper anodes. Increase anode current density.

OFF-COLOR DEPOSITS

1. *Zinc*: Zinc will cause a brassy deposit.
2. *Lead*: Lead will cause a dark rough deposit.

ANODE POLARIZATION

1. *Excess Carbonate*
2. *Low Free Cyanide*
3. *High Anode Current Density*
4. *Low Temperature*

LOW CATHODE EFFICIENCY

1. *Low Metal Content*
2. *High Free Cyanide*
3. *Low Temperature*

PITTED DEPOSITS

1. *Low Cathode Efficiency*
2. *Low Anti-Pit Agent*

LOW CONDUCTIVITY

1. *Low Caustic Content*

CYANIDE DECOMPOSITION

1. *Low Anode Efficiency*: Increase anode area and check

caustic content.

2. *High Temperature.*
3. *High Free Cyanide.*

WATER BREAKS

1. *High Anti-Pit Agent*: If water will not form a continuous film over the cathode after plating and rinsing, treat the bath with activated carbon. Cathodic cleaning after plating may serve as a temporary remedy.

Cyanide Gold

TYPICAL BATH COMPOSITION[17]

	g./L.	oz./gal.
Metallic gold	2.1	0.25
Potassium cyanide	15	2
Dipotassium phosphate	4	0.5

The most significant thing that can be said about gold baths is that there has been relatively little published about them as compared to the other well known baths.

THIN DEPOSITS—LOW CATHODE EFFICIENCY

1. *Low Metal Content.*
2. *Low Free Cyanide.*
3. *Low Temperature.*
4. *High Current Density.*

COLOR OF DEPOSITS

1. *Pink or Red*: Copper
2. *Green*: Silver and Cadmium.
3. *White*: Nickel and Zinc.
4. *Black*: Lead.

HIGH METAL CONTENT

Due to excessive anode area.

OFF-COLOR DEPOSITS

1. *Impurities.*
2. *Deposit Too Thin.*

Acid Lead

TYPICAL BATH COMPOSITION[18]

	g./L.	oz./gal.
Lead fluoborate	105	14
Free fluoboric acid	40	5.3
Glue	.2-5	.03-.7

LOW LEAD CONTENT

1. *Spongy Deposit at High Current Density.*
2. *Poor Covering Power at Low Current Density.*

HIGH LEAD CONTENT

No apparent effect.

ADDITION AGENT

1. *Crystalline Plate.* Add gelatin or glue.
2. *Brittle Plate.* Due to excessive addition agent. Treat with activiated carbon.
3. *Control by Experience.*

Acid Iron Bath

TYPICAL BATH COMPOSITION[19]

	g./L.	oz./gal.
Ferrous chloride	400-500	54-67

The ferrous chloride bath is operated at high temperature with periodic additions of hydrochloric acid to maintain an acidity of about .01 normal. Little trouble is experienced with metallic impurities.

BRITTLE DEPOSITS

1. *Low Temperature.*
2. *Organic Impurities.* Treat with activated carbon.

PITTED DEPOSITS

1. *Ferric Iron.* Add excess acid to reduce ferric iron by chemical action on anodes.

ROUGH DEPOSITS

1. *Suspended Solids in Bath.* Filter.
2. *Particles from Anodes.* Use ingot iron anodes and bag if necessary.

Cyanide Silver

TYPICAL BATH COMPOSITION[20]

	g./L.	oz./gal.
Silver (metal)	25-33	3.3-4.4
Free potassium cyanide	30-45	4-6
Potassium carbonate	30-90	4-12

BURNT DEPOSITS

Dark or rough deposits in high current density areas may be avoided by agitation, increasing the metal content, increasing the temperature or the use of addition agent.

ROUGH DEPOSITS

1. *Suspended Solids.*
2. *Particles from Anodes.*
3. *Metallic impurities*: Including lead, bismuth, manganese, tellurium, selenium, sulfur, antimony. If the specific trouble is not known, treat the bath with activated carbon, bag the anodes, filter and electrolyze at low current density.

POLARIZED ANODES

1. *High Current Density.*
2. *High Carbonate*
3. *Low Cyanide.*
4. *High Metal Content.*

Alkaline Tin

TYPICAL BATH COMPOSITION[21]

	g./L.	oz./gal.
Sodium stannate	90	12
Caustic soda	7.5	1
Sodium acetate	15	2
Hydrogen peroxide (100 vol.)	0.5	1/16

DARK SPONGY DEPOSITS

This may be the result of contamination by lead, antimony or arsenic, which may be corrected by electrolysis or, it may be due to the presence of stannite ions which may be oxidized to stannate ions by the addition of hydrogen peroxide or sodium perborate. The conditions leading to the formation of stannite ions are 1. Too low an anode current density and 2. Improper anode current density-caustic soda content relationship.

Low Cathode Efficiency

This can result from:

1. *Too high a cathode current density.*
2. *Too low caustic soda content.*
3. *Too low operating temperature.*
4. *Too low overall concentration.*

Excessive Insoluble Salt Formation

This not too serious problem occurs when the alkalinity of the bath is too low and carbon dioxide is absorbed from the air or precipitation due to the hardness of the water used.

Poor Throwing Power

Throwing power is improved by the following:

1. *Increasing the metal concentration.*
2. *Increasing caustic content.*
3. *Increasing carbonate content.*
4. *Addition of sodium acetate.*

Anodes

At optimum operating conditions, the anodes are coated with a greenish-yellow film. Greyish colored anodes indicate too low a current density while black anodes indicate too high a current density.

Acid Zinc

Typical Bath Composition[22]

	g./L.	oz./gal.
Zinc sulfate, crystal	240	32
Ammonium chloride	15	2
Aluminum sulfate	30	4
Licorice	1	.13

Rough or Pitted Deposits

Suspended Material. Filter the solution and bag anodes.

Blistered Deposits

Improve Cleaning Cycle.

Low Cathode Efficiency

1. *Low Metal.*
2. *Excess Addition Agent.*

Metallic Impurities

1. *Cadmium.* Remove with sponge zinc.
2. *Iron.* Oxidize with peroxide, neutralize the bath with zinc metal and filter off the ferric hydroxide.

Cyanide Zinc

Typical Bath Composition[23]

	g./L.	oz./gal.
Zinc cyanide	60	8
Sodium cyanide	23	3
Sodium hydroxide	53	7

Zinc plating is extensively used to prevent rusting of iron and steel.

In recent years, processes have been developed whereby a bright plate may be obtained through the use of addition agents.

Dull Deposits

1. *Low Ratio NaCN/Zn.* Increase NaCN or reduce Zn.
2. *High Caustic Soda.*
3. *Metallic Impurities.* Lead, copper and cadmium may be removed by treatment with zinc dust followed by filtering to prevent resolution of the precipitate. Lead may be removed by treatment with sodium sulfide.

Blistered Deposits

1. *Poor Pickling.*
2. *High Ratio NaCN/Zn.*
3. *Metallic Impurities.*

Crystalline Deposits

High Caustic Soda.

Excessive Anode Polarization

Low Caustic Soda.

Excessive Gassing—Low Cathode Efficiency

1. *Low Metal.*
2. *High Ratio NaCN/Zn.*

Bright Deposits

1. *Addition Agent Control.* By careful observation of the deposit or by plating tests.[24]
2. *Careful Control of Chemical Limits.*
3. *Control of Metallic Impurities in Bath.*

Nickel

Typical Bath Composition[25]

Watts Bath

	g./L.	oz./gal.
Nickel sulfate	240	32
Nickel chloride	45	6
Boric acid	30	4

A considerable amount of information and numerous bath formulations are available on nickel plating which indicate both the importance of the nickel bath and the complexity of its operation.

The Watts' type bath operated at a pH range of 1.5-3.0 or 4.5-5.6 has met with wide favor in the industry and the following discussion will be limited to this bath.

Addition Agent Control

The bright nickel baths used for protective and decorative plating incorporate the use of one or more addition agents to refine the grain size and brighten the deposit. Most of these brighteners are proprietary compounds, and the methods for their control are given by their suppliers.

pH Range

The choice of pH range is governed by the type of work being processed or the final results desired. The advantages of operating at either a high or low pH are listed below:

a. *Low pH:*
   1. Wide current density plating range.
   2. High permissible current density.
   3. Less tendency toward rough deposits caused by metallic impurities.
   4. Softer deposits.

b. *High pH:*
   1. Superior throwing power.
   2. Superior covering power.
   3. High cathode efficiency.
   4. Harder deposits.

POOR THROWING POWER

a. *Low pH Bath*:
   1. Temperature too low.
   2. Low current density.
   3. Low metal content.
   4. Iron contamination. Remove by first treating with permanganate, then with nickel hydroxide or nickel carbonate.
   5. Excessive amount of hydrogen peroxide present.
   6. Copper or zinc contamination.
   7. Organic contamination reduces covering power.

b. *High pH Bath*:
   1. High current density.
   2. Excessive amount of peroxide present.
   3. Contamination by other metals.

LOW CATHODE EFFICIENCY

1. Low chloride content reduces the cathode efficiency at low current densities.
2. Current density too high.
3. Temperature too low.
4. Low overall metal concentration.
5. pH too low.
6. Copper or zinc contamination.

POOR CONDUCTIVITY

1. Low overall metal content.

BURNT DEPOSITS

1. Low metal content.
2. Low operating temperature.
3. Low chloride content.
4. Excessive amount of hydrogen peroxide present.
5. Current density too high.

PITTED DEPOSITS

1. Little or no boric acid present.
2. Metallic impurities in bath.
3. Need for wetting agents.
4. Need for hydrogen peroxide treatment providing no organic addition agents are present.

ROUGH DEPOSITS

a. *Bath Composition*:
   1. Inclusions of basic materials due either to high pH, absence of boric acid, or high current density.
   2. Low chloride. Chloride tends to improve smoothness of deposit.

b. *Contaminants Removed By Filtration*:
   1. Anode particles and sludge.
   2. Dust particles.
   3. Ferric hydroxide, provided operating pH is high enough to cause its precipitation.
   4. Insoluble material contained in plating salts.

SOFT DEPOSITS

1. Boric acid content too high.
2. Operating temperature too high.
3. Low pH.

HARD, BRITTLE DEPOSITS

1. Excessive amounts of hydrogen peroxide can cause embrittlement of the plate.
2. Absence of boric acid may result in hard, cracked deposits.
3. Alkali or ammonium salt contamination.
4. Iron contamination.

ABNORMAL pH VARIATION

1. Low boric acid.
2. Poor anode corrosion caused by low chloride, excessive anode current density, high pH or impurities in the anodes.

OFF-COLOR DEPOSITS

1. Copper and zinc contamination result in dark colored deposits especially in low current density areas. These are most satisfactorily removed by electrolysis at extremely low current density.

ANODES POLARIZED OR POORLY CORRODED

1. Anode current density too high.
2. Chloride content too low.
3. Impurities in anodes.
4. pH too high.

Conclusions

In order to continuously operate plating baths successfully, the plater must be prepared to deal with trouble. Specific troubles are so numerous that the only safeguard against them is a knowledge of the tools and methods used to investigate the behavior of the anode, the electrolyte, the quality of the deposit and the endurance of the product.

The literature answers most routine questions, but extensive literature references and lively discussion over a paper on modern nickel baths[25] indicate that it is not feasible to try to find all the answers in the literature. The answer to the problem is to study the properties of the process and the product and to learn how to control each, and how to use and interpret significant tests in the event of trouble.

Acknowledgment

The authors wish to thank Mr. F. H. MacIntyre and Mr. R. O. Hull for reviewing this material prior to publication.

References

16. H. L. Benner & C. J. Wernlund. Trans. Electrochem. Soc., 80, 355 (1940).
17. L. Weisberg & A. K. Graham. Trans. Electrochem. Soc., 80, 509 (1941).
18. F. C. Mathers. Plating & Finishing Guidebook, p. 71 (1945).
19. C. T. Thomas. Trans. Electrochem. Soc., **80**, 499 (1941).
20. N. E. Promisel & D. Wood. Trans. Electrochem. Soc., **80**, 459 (1941).
21. F. F. Oplinger & Fred Bauch. Trans. Electrochem. Soc., 80, 617 (1941).
22. W. Blum & G. B. Hogaboom. "Principles of Electroplating and Electroforming", p. 316 (1930).
23. R. O. Hull & C. J. Wernlund. Trans. Electrochem. Soc., 80, (1941).
24 R. O. Hull. Monthly Rev., Amer. Electroplaters' Soc., 26, 753 (1939).
25. W. L. Pinner, G. Soderberg & E. M. Baker. Trans. Electrochem. Soc., **80**, 539 (1941.
26. H. Brandes. Trans. Electrochem., **88**, Preprint 26 (1945).

Method of Evaluating Metal Cleaners

By Samuel Spring, Howard I. Forman, and Louise F. Peale

Frankford Arsenal, Philadelphia, Pa.

A quantitative method for performance evaluation of alkaline metal cleaners is described and discussed. Reproducibility is rather good. The method involves coating of metal panels with various oils by a specific dipping and drainage technique, followed by a carefully controlled cleaning and rinsing procedure. The panels are covered with a fine spray of water, which condenses as droplets on the oil-covered areas, providing a pattern that remains constant for a sufficient time for a sketch to be drawn on paper divided into 100 squares. The average value for cleaned area of 5 panels is the cleaning efficiency index. Conditions influencing results and variations in the procedure are discussed.

THE importance of having an adequate method for evaluating alkaline cleaners for the removal of contaminants from metal surfaces is generally agreed upon. Morgan and Lankler made an important contribution in this direction[3] in 1942 in devising a semiquantitative method that involved photographing fluorescent oil residues under ultraviolet light after a standard cleaning procedure. It was applied specifically to the removal of mineral oil by alkaline salts containing a surface-active agent of the sodium keryl benzene sulfonate type.[2] This procedure is rather unwieldly, particularly for the control and procurement of alkaline cleaners.

The "water-break" method has been used for a long time as a criterion for evaluating metal surface cleanliness. This test is based on the ability of metal surfaces to sustain an unbroken film of water when "chemically" clean. It has not been found adequate, since the water-break pattern was observed to be dependent on the thickness of the water film. Smaller and smaller areas sustaining a complete water film were obtained as the water drained from the panel. As these areas began to reach a more or less steady state, evaporation of the water became a factor in obscuring the results. As a result of these factors, evaluations performed with the water-break test, as normally used, did not provide an adequate estimate of the efficiency of metal cleaners.

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For these reasons, a method has been devised which is fairly simple and has been found capable of yielding results of good reproducibility.

Procedure

Some of modifications desirable for application to specific problems are obvious. In general, the method used at the arsenal involves coating of panels by a controlled dipping and drainage technique, followed by carefully controlled cleaning and rinsing operations. The panels are then subjected to a fine spray of water, which has the effect of sharply delineating the oil-covered regions. Quantitative estimation is made by sketching this pattern on paper divided into squares and counting the number of squares that are free of oil.

PREPARATION OF PANELS. The panels are of light-gage metal, 10 cm. (4 inches) square, of cold-rolled SAE 1010 steel. Cold-rolled brass or aluminum may also be used. Two holes are drilled in each panel to enable the insertion of a 2-pronged panel holder (Figure 1) which maintains the panel in position without the use of nuts and bolts or similar arrangements. This was found necessary because other holders trapped some of the oil, which afterward spread and gave erroneous values. The steel panels are degreased before use with an alkaline silicate plus a synthetic detergent and rinsed with water until a complete water film is sustained. They are then pickled at room temperature, for 1 minute, in 6 *N* hydrochloric acid containing a small amount of wetting agent, rinsed in running cold water for a short time, given two successive rinses in hot alcohol containing 1% ammonia (70° to 80° C.), air-dried, and stored in an evacuated desiccator until used.

COATING OF PANELS. The panel is immersed in the oil to about half its height. The container is tilted so that the entire panel is covered with oil and then returned to an upright position such that the excess of oil drains from around the holes in the panel. The panel holder prongs are inserted and the panel is hung in a rack at a 45° angle (see Figure 1).

The panels are allowed to drain at 25° ± 2° C. for 1 hour. The globule of oil that remains on the bottom corner is removed. The panels should be shielded from drafts during the drainage period.

It is desirable to determine the weight of oil on individual panels at frequent intervals to ensure control over these conditions.

Two oils are used for coating panels. In one case, the coat-

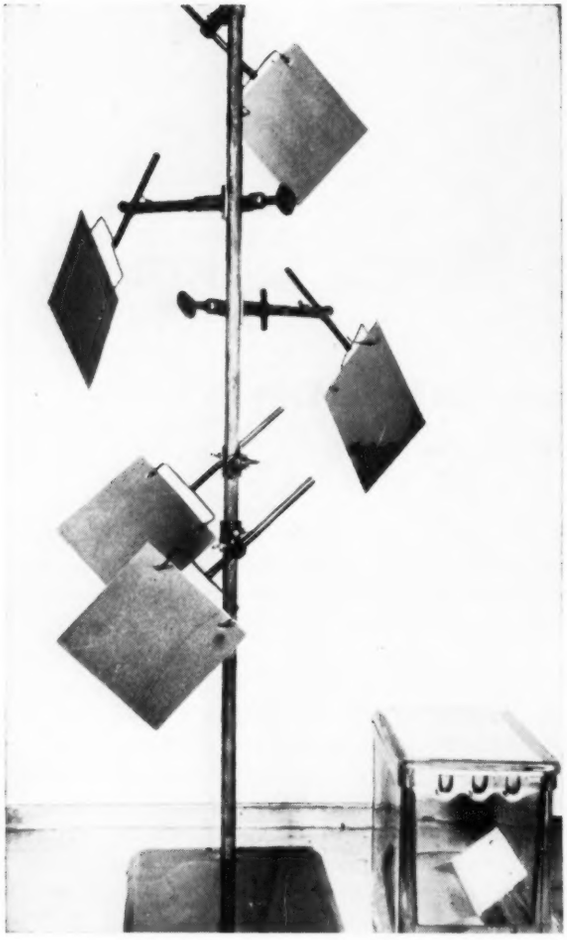


Figure 1. Coating technique.

ing is obtained from a hydraulic mineral oil of high viscosity index, with a viscosity at 100° F. of 470 seconds Saybolt Universal viscosity. In the other case, the coating is obtained from a solution of a sulfurized lard oil, containing approximately 12% sulfur, dissolved in toluene to the extent of 1 part of sulfurized oil to 9 parts of toluene. In the work performed with this procedure, the average weight of oil on each panel after coating with mineral oil was 0.283 gram and after coating with sulfurized fatty oil was 0.038 gram. Maximum variations were ±4% for the mineral oil and ±6% for the sulfurized fatty oil, with the great majority of the weights varying from the average by no more than 2%.

Alkaline Salt Solutions. The alkaline salts and surface-active agents are dissolved in water to make 2 liters of solution of appropriate concentration. Solutions of 1.5 or 3.0% of alkaline cleaner are usually employed. The beaker containing the solution is heated and then placed in a constant-temperature bath in which the temperature of the solution is maintained at 60° ± 1° C.

Cleaning and Rinsing Operations. The panel holder is inserted through a cover which tends to reduce evaporation, and connected to a small motor (Figure 2). The panel is positioned in the cleaner so that at least 2.5 cm. (1 inch) of the solution are above the top of the panel, to reduce the effect of temperature changes near the surface. The motor is operated at 10 r.p.m. and the cleaning process is carried on for 5 minutes. The panel is then withdrawn and placed in a tank of running water maintained at 50° C. It is withdrawn from the water once each minute during a rinsing period of 5 minutes. The panel is then rinsed in water at room temperature for 1 minute and allowed to drain for 1 minute.

Quantitative Evaluation. A fine spray of water is directed at the panel from a distance of approximately 60 cm. (2 feet) by means of an atomizer connected to a compressed air line. (The head of a De Vilbis bulb atomizer was attached to a compressed air line equipped with a reducing valve. A small spray gun, such as is used for spraying paint, was also employed. The air is filtered through glass wool.) The oil-covered regions are delineated by the condensation upon them of fine droplets of water, resulting in a pattern which remains constant for at least 20 minutes (Figure 3). These are then sketched on paper ruled into 100 squares (Figure 4). The number of squares covered with water (no droplets condensed) is counted for each side of the panel. The results obtained with 5 panels, resulting in 10 observations, are averaged and this is called the cleaning efficiency index. The standard deviation is determined by the formula:

$$\text{Standard deviation} = \sqrt{\frac{\Sigma d^2}{n-1}}$$

d = deviation of individual values from the mean
n = number of observations

Individual values deviating from the mean by more than three times the standard deviation are discarded. The entire determination is discarded when the standard deviation is greater than 9. A large value for the standard deviation was found to be due to variations in the temperature of the room during the drainage of oil from the panels. The frequency of this occurrence, however, is not sufficient to interfere with the usefulness of the method.

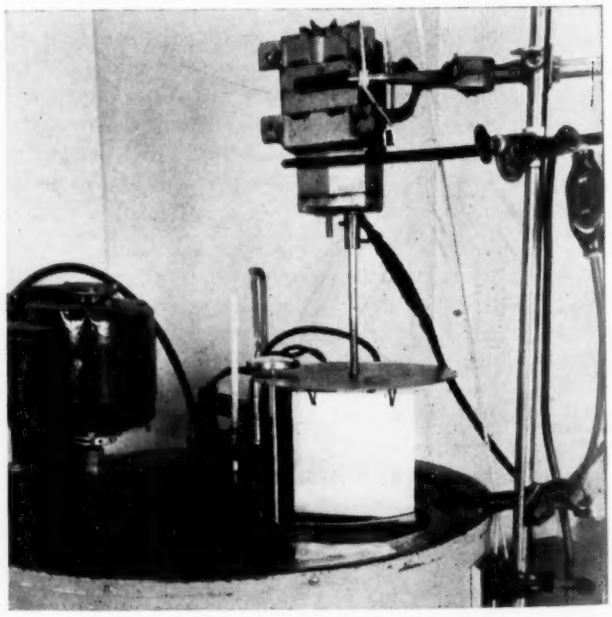


Figure 2. Assembly before test.

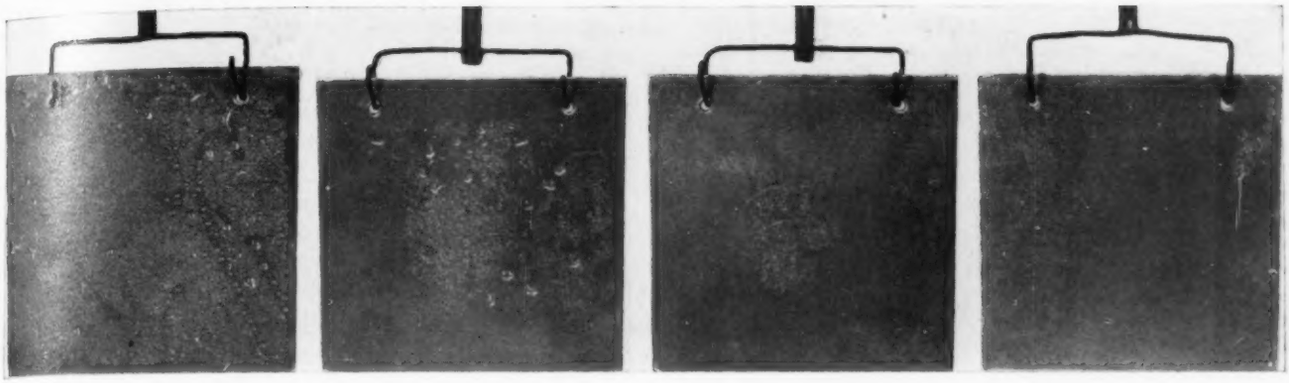


Figure 3. Test Panels.

1 2 3 4

1. Poor cleaning (cleaning index 6). 2. Fair cleaning (cleaning index 73). 3. Fair to good cleaning (cleaning index 88). 4. Good cleaning (cleaning index 94).

TABLE I

Effect of Surface Smoothness of Aluminum Panels

Oil	Cleaning Index: Aluminum (mirror finish)	Cleaning Index: Aluminum (roughened)
Light mineral oil	99	89
Heavy mineral oil in toluene (1 to 3)	97	11
Lard oil (Prime No. 1)	94	17
Sulfurized mineral oil	95	23
Sulfurized fatty-mineral oil	88	2
Sulfurized fatty base in mineral oil	84	11

Discussion

SELECTION OF PANELS. The surface condition of metal panels has a considerable bearing on cleaning efficiency. In utilizing this test to solve specific problems, therefore, panels should be selected with surfaces similar to those involved in the problem. So far as the test itself is concerned, the conditions listed above are out of the critical range for surface variations.

COATING OF PANELS. It was observed that the ease of removal of oil from the panels was dependent to some extent upon the oil film that was used. Thus, specific differences were observed between sulfurized fatty base oils and mineral or lard oils under certain conditions. Another very important factor was the viscosity of the oil used. It may be seen from Table II that the ease of oil removal decreased as the viscosity of the oil and the weight of oil on the panel increased. The distribution of oil on each of the panels is not uniform, since during the drainage period a greater amount of oil is concentrated on the lower portion of the panel. In a great many tests, however, it was observed that results were not consistently poorer for the lower half of the panel than for the top half, even though approximately two thirds of the total oil was on the bottom half of the panel.

One of the factors that controlled the reproducibility of results to a great extent, in utilizing the above coating procedure, was the temperature at which the excess oil was drained from the panel. In order to obviate difficulties due to this, it was found necessary to maintain the drainage temperature within ±2° C. at 25° C. during the 1-hour period. Examination of the data in Table III indicates that in this range the temperature effect is less than that due to random variables. Lower temperatures resulted in erratic results; higher temperatures in better results which were reproducible. After considerable experience with a particular set of conditions, it should be possible to apply a correction factor for various room temperatures during the hour-long drainage period.

CLEANING AND RINSING OPERATIONS. A temperature of 60° C. (140° F.) was utilized in the procedure. This temperature is somewhat lower than that recorded for most in-

TABLE II

Effect of Viscosity of Mineral Oil on Cleaning Efficiency

Viscosity at 100° F. *Sec. S.U.V.*	Cleaning Index	Weight of Oil on Each Panel *Gram*	No. of Determinations
970	11	0.454	2
651	42	0.378	7
456	55	0.336	6
283	95	0.265	6

Cleaner, 3% sodium orthosilicate plus 0.15% sodium keryl benzene sulfonate (40%).

Conditions, 60° C., 10 r.p.m., 5 minutes.

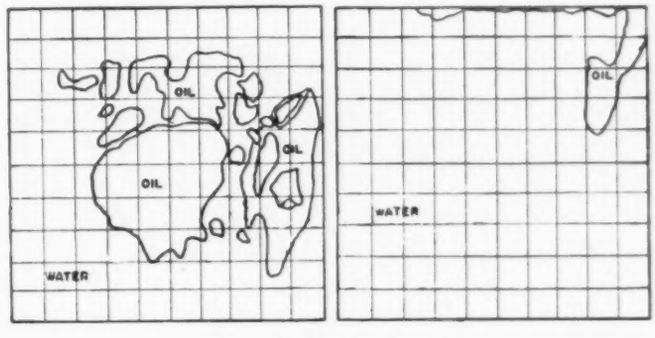


Figure 4. Cleaning Results.

Left. Cleaning index 73 (fair). Right. Cleaning index 94 (good).

TABLE III

Typical Reproducibility Data

	Temp., ° C.	Medium Mineral Oil[a] Cleaning efficiency index	Medium Mineral Oil[a] Standard deviation	Sulfurized Fatty Oil Base[b] Cleaning efficiency index	Sulfurized Fatty Oil Base[b] Standard deviation
1	25	56	6	80	9
2	25	53	5	86	8
3	23	55	5	85	5
4	24	53	3	81	6
5	24	55	5	83	6
6	26	56	8	85	6

[a] Mineral oil of high viscosity index. Viscosity 470 sec. per 100° F. S.U.V. Av. weight 0.283 gram.

[b] Sulfurized fatty oil in toluene (1 to 9). Av. weight 0.038 gram. Temperature between 23° and 27° C.

Cleaner, 3% sodium orthosilicate plus 0.15% sodium keryl benzene sulfonate (40%). Conditions, 5 minutes, 10 r.p.m., 60° C.

dustrial cleaning operations, although it is not uncommon for the temperature of production cleaning tanks to drop to this level. Cleaning efficiency improved rapidly as the temperature of cleaning was increased above 60° C. This tended to obscure differences among cleaners and the various factors affecting cleaning.

The effect of agitation, up to 36 revolutions per minute, was found to be fairly small. Generally, the effect of concentration of alkali was considerable up to a minimal value, beyond which large increases in concentration caused relatively small improvements in cleaning efficiency. The concentration of 3% alkaline salts in the above procedure was found to be above this minimum concentration for most conditions. Lower concentrations of alkaline salts tended to accentuate differences among surface-active agents.

Variations in the rinse-water temperature were found to be not very important. In the procedure a fairly long rinsing time is provided at a fairly high temperature. Under these conditions it was found unnecessary to dip the panels in dilute acid, prior to the evaluation, to avoid "false water film continuity" [1] due to the presence of some of the surface-active agent. The main reason for eliminating the acid rinse was that rusting of the panel developed after this rinse and tended to obscure the patterns of oil-covered areas that were being sketched.

EVALUATION AND REPRODUCIBILITY. While the spraying of the panel with water is not extremely critical, care should be exercised to prevent its becoming drenched with a large excess of water. Two or three fairly slow passes with a fine spray of water appear to be optimum. It is also desirable to avoid having the water under very high pressure or the spray source close to the panel.

One possible source of a subjective error lies in the sketching of the pattern of oil-covered areas disclosed by the condensation of the spray of water. Comparison of the values obtained with three different operators, on a number of occasions, indicated that this error was rather small, being less than 2%. For operators who might have difficulty in this evaluation, it is possible to provide assistance in the form of a viewing screen divided into 100 squares or some similar arrangement.

Some reproducibility data, obtained on different days over a period of several months, are listed in Table III. The values for cleaning index fall well within the range to be anticapted from the magnitude of the standard deviation.

Appreciation is expressed to Lt. Col. C. H. Greenall, officer-in-charge, Maj. W. W. Culbertson, research officer, C. C. Fawcett, associate director, and E. R. Rechel, chief of the Chemical Research Section of Frankford Arsenal Laboratory, as well as the Ordnance Department, for permission to publish this paper. Special thanks are due J. W. Mitchell for his helpful review of the paper.

Literature Cited

1. Harris, J. C., *A.S.T.M. Bull.*, **136**, 39 (1945).
2. Morgan, O., and Lankler, J. G., Ind. Eng. Chem., **34**, 1158 (1942).
3. Morgan O., and Lankler, J. G., Ind. Eng. Chem., Anal. Ed., **14**, 725 (1942).

Presented at the spring meeting of the Philadelphia Section and the Meeting-in-Print of the AMERICAN CHEMICAL SOCIETY, Division of Analytical and Micro Chemistry, 1945.

POLISHING METHODS

(*Concluded from page* 292)

machines that are satisfactory for numerous types of work, and may be set up to do several high production items in a plant with a minimum of adjustment for each item. The automatic is not limited as to the size of the item to be polished, but it is sometimes limited as to efficiency on both large and small items. This can only be predetermined by those experienced in the field. You can feel assured that the machine recommended will do the job because the expense of building and setting up this equipment is too great and the manufacturer of the machine realizes that his reputation is at stake with each machine.

Electro-polishing is in its infancy and is restricted at this time to certain items of certain metals. I believe that this is going to cover a broader scope within a few years. Theoretically, electro-polishing has more possibilities than automatic mechanical polishing because of its probable use in bulk polishing and for articles of irregular shape.

As was stated earlier, the evolution of polishing and buffing has been slow but its importance to quality plated work in production has focused attention on its development ar possibilities so who knows what the ingenuity of today will bring tomorrow?

SHOP PROBLEMS

PLATING AND FINISHING
POLISHING—BUFFING
CLEANING — PICKLING
HOT DIP FINISHES

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Thickness Determination

Question: I am interested in determining the thickness of a silver plate on phosphor bronze.

An article by R. B. Salonstall in your Oct. 1944 issue mentions that a dropping test can be used for silver. Can you give me details of this test?

C. E. M.

Answer: The jet test is employed for this purpose with a solution consisting of:

Potassium iodide	250 g./L.
Iodine	7.44 "

At 25° C. the penetration is 0.0001 inches in 5.6 seconds. Details will be found on pages 162 through 163 of the 1945 edition of the *Plating and Finishing Guidebook.*

Patents

Question: Will you please let me know by mail if the Gardam or Wood solutions for plating on stainless steel are patented. If so, can you give me their patent numbers.

A. D. S.

Answer: Our files do not show any patents issued to either Gardam or Wood but there are a number of patents on a strike for stainless steel consisting of an acid solution plus a metal salt. The Mond Nickel Company have a patent, for example, (British patent #503,008) on a process of striking anodically followed by plating in a nickel chloride-hydrochloric acid solution quite similar in composition to that recommended by Wood.

Gold Plating Dog Tags

Question: I am a disabled veteran and I, in an effort to establish myself in some work which I can do at home, I'm trying to start a by-mail plating service. My idea is to gold-plate dog-tags for ex-servicemen but I have run into a problem and it is about this that I hope you can advise me.

Many of the dog-tags which were distributed by the armed forces are made of corrosive-resistant steel alloy. I've tried all ordinary means to gold-plate these and have had no success.

C. R. M.

Answer: We suggest the following procedure:

1. Clean in alkaline cleaner.
2. Rinse and dip in 50% by volume muriatic acid.
3. Rinse and strike in the following:

Nickel chloride	2 lbs./gal.
Muriatic acid	1 pt./gal.

6 volts, direct current, room temperature—nickel or carbon anodes.

After a 15 to 30 second strike in the above, the article can be rinsed and plated in any desired solution.

Bright Dipping

Question: I receive your *Metal Finishing Magazine* monthly. I am in the electroplating line only four months and am not doing so good due to the difficulty of finding the proper formula for bright dipping the enclosed item. I've tried quite a few formulas for bright dipping but I can't seem to get a finish on it as the enclosed item. I am a veteran of 4½ years service and no schools are set up under the G. I. bill of rights for this kind of work, so any information I receive from you will be greatly appreciated. I have been using a sulfuric, nitric, muriatic and water solution but with no success.

Also please forward me all the information needed for electrolytic polishing on brass novelties. Mechanical polishing is too expensive for my cheap product.

J. I.

Answer: We do not know of any method in commercial use for electrolytic polishing brass novelties. Cheap products are generally bright dipped and ball burnished.

Tight springs are very difficult to rinse after acid bright dipping. We would suggest that you try the dichromate dip which contains the following:

Sulfuric acid	12 oz./gal.
Sodium dichromate	4 "

Nickel Plating Brass Castings

Question: At present we are having trouble with much peeling of our work. We cast high brass castings in our foundry, then grind and polish in our buffing department. Our procedure consists of a pre-cleaning in our electro-cleaning tank, then the work is high color buffed. We clean these castings thoroughly in the same electro-cleaning tank, dip in 20% solution of muriatic acid, rinse, dip in an 8 oz. per gallon solution of sodium cyanide. rinse thoroughly, then place in nickel solution for 15 minutes. The castings are dryed and nickel buffed, then placed in the chrome plating tank for three minutes.

On removing the casting from the chromium tank we find scaling and peeled pieces. Our problem seems to be poor adhesion of the nickel. Can you suggest any changes in our cleaning and plating procedure that will help clear up these conditions?

S. S.

Answer: A short flash is suggested in a hot cyanide copper solution before nickel plating since the castings may contain lead or tin. The solution should be kept at a temperature above 70° F.

Copper Refining

Question: We are interested in studying the field of copper refining by the electrolytic method as practiced in industry. It has occurred to us that possibly you could advise as to whether there has been published any articles on this subject in *Metal Finishing.* Our particular interest at the present time is in determining the cost involved in operating a refinery and especially the breakdown of this cost into its various steps of operation. Such data as original installation costs, depreciation,

operation, etc., would of necessity enter the picture. If your magazine has not carried articles of this nature, I would appreciate any information that you could furnish as to possible sources. May I express my thanks at this time for whatever information you may be able to advance.

N. D. C.

Answer: Some interesting information will be found in the book, "Industrial Electrochemistry," by C. L. Mantell. Papers have been presented on this subject from time to time before the Electrochemical Society. We suggest that you examine recent volumes of this Society's Transactions.

ABSTRACTS OF PAPERS

(Concluded from page 287)

cleaned, they are subjected to either a low voltage alternating or direct current in a film forming electrolyte containing caustic soda with organic and inorganic additives. After application, the protective coatings are then processed for proper paint adhesion or colored with organic dye solutions.

The abrasion resistance, galvanic corrosion resistance and paint adhesion of the resulting finishes are highly desirable for applying protective coatings to magnesium parts for military aircraft. The decorative properties of this process for consumers goods may be greatly enhanced by application of dye coloring.

One of the main limitations in the use of magnesium alloys is their tendency to develop a couple when brought in contact with dissimilar metals. This can be greatly overcome by first applying an insulating finish to the magnesium alloys. Manodyz finish properly sealed offers considerable improvement over the conventional dichromate finishes in this respect.

Based on excellent test results obtained by extensive study of dissimilar metal contact corrosion, the Manodyz AC and DC processes have been recommended by the Army as satisfactory alternate for specification AN-M-12 Type 111, Acid dichromate finish.

Practical Facts About Polishing and Buffing Compounds

By Howard J. McAleer

Formax Manufacturing Company

The application of the correct amount of buffing compound at the correct time, without being wasteful on automatic buffing machine operation, has long been a serious and costly problem. Large stubs or nubbins of buffing compounds are left unused that add considerably to the cost of compounds used.

The development of polishing and buffing compounds in a liquid form that can be sprayed on the buff or polishing wheel has eliminated these disadvantages at a considerable saving.

The equipment required is:

1. Necessary air supply.
2. Air regulator or transformer to reduce main line pressure.
3. Pressure tank and reservoir for storing the compound under pressure.
4. Spray gun head mounted near the buffing or polishing wheel.
5. Either foot or automatic cam or electric release valves to spray the compound to the buff or to the work.

Because the compound is in a liquid form the cutting action of the abrasive is not cushioned by the surrounding ordinarily used higher melting point greases such as found in bar or cake compounds. The saving is often as much as 50% of the weight of compound.

Further advantages include the increase of as much as 25% of the buff life as the "compound head" is constantly maintained.

There is no reasonable limit to the number of spray guns that can be operated from one single pressure reservoir tank.

Another important point of advantage, to the plater, is the fact that these liquid buffing compounds are easily cleaned from the buffed work.

Parkerizing—Growth or Shrinkage

By N. A. Tope

Humber, Ltd., England

In the early days of this war, it became necessary to apply a phosphate coating to a special 3/8" diameter stud, made in high tensile (S. 65) steel. The studs had the unusual feature of a high precision ground thread, but were mass produced, and it was necessary to maintain the threads within very close dimensional limits throughout. Several batches were rejected and an examination indicated that in some cases they had grown as much as 0.004" on the effective diameter, whilst the coatings were excessively crystalline in appearance.

The conclusions arrived at from experimental work are listed:

1. When threaded components in S. 65 materials are processed by the normal Parker A. process the dimensional change on the effective diameter may vary from —0.001" to + 0.004" according to the processing conditions.

2. Coarsely crystalline coatings are indicative of large dimensional increases, but fine coatings may accompany either a slight increase or decrease.

3. Acid etching and alkali pre-treatments tend to produce large increases. Degreasing in trichlorethylene followed by seven minutes in a suitable wetting agent or boiling in water for at least 20 minutes are adequate pre-treatments which will not cause excessive growth.

4. Departures from specified conditions of concentration, temperature and time will not cause great variations, but it is desirable to control these factors as closely as possible.

5. Agitation or sludge disturbance, so that the sludge mixes with the supernatant liquor will result in excessive growth and rough coating.

6. The extent to which the sludge is dispersed in the supernatant liquor would appear the prime factor in dimensional changes.

7. When a solution has been in use for an hour or so a state of equilibrium will be set up between the rate at which the sludge passes into solution.

8. In a still solution the rate of sludge dispersion would appear to depend upon several factors.

9. A barrel processing unit, suitably modified to prevent undue disturbance of the sludge constitutes an almost ideal piece of equipment.

Since the above investigation was carried out, the opportunity was taken of examining the dimensional changes which take place when other nickel chrome and plain carbon steels are treated with the Parker "A" process. The observations indicate that the stated principles apply although the magnitude of the changes may vary slightly.

Research in Electroplating

By C. E. Heussner

Chrysler Corporation

Seven universities and institutions have affiliated themselves in the research work of the A. E. S.

Indiana University
Lehigh University
University of Michigan
Michigan State College
Princeton University
Pennsylvania State College
National Bureau of Standards

The establishment of a new project, on Physical Properties of Electrodeposited Metal was made at the Bureau of Standards with *Dr. Abner Brenner* as Project Director.

The following directors made a report on the progress of the research investigations.

Stripping of Copper from Various Base Works

Dr. F. C. Mathers, University of Indiana.

Determination of Impurities in Electroplating Solutions

Dr. E. J. Serfass, Lehigh University.

Methods for Testing Adhesion of Electrodeposits

Prof. A. L. Ferguson, University of Michigan.

Effect of Surface Finishing of Nonferrous Base Metals on Protective Value of Plated Coatings

Dr. William Blum, National Bureau of Standards.

Present Trends in Legislation Affecting Research and Patents

R. C. Watson, Research Committee Counsel.

Effect of Impurities and Purification of Electroplating Solutions

Prof. D. T. Ewing, Michigan State College.

The Nature and Effect of Porosity in Electrodeposits

Dr. N. Thon, Princeton University.

Methods for Testing Thickness of Electrodeposits

Prof. H. J. Read, Pennsylvania State College.

Polarization at Electrodes in Electroplating Processes

Prof. A. L. Ferguson, University of Michigan.

THIS IS WASHINGTON—

By George W. Grupp
METAL FINISHING's Washington Correspondent

Electroplaters Are Responsible Citizens Electroplaters are serious minded responsible citizens. Most of them would not intenitionally do anything which would cause pain and suffering to other human beings. As a whole they are hard workers who love what they are doing. They take pride in their work. They aim to render service which will please their customers. But in their zeal to satisfy the plating needs of their customers one wonders if all of them are aware that in their innocence some of their work may cause suffering to some members of human society. Some may not realize it, but, all of them are in a position to endanger or preserve human health and life.

Cadmium Plating Increased During the War Everyone knows that human health and life are precious. To preserve them, as far as it is humanly possible, the armed forces were supplied with all sorts of weapons to bring the recent world-wide international conflict to an end at the earliest possible moment. During this titanic struggle there were shortages of materials. Substitutes had to be found. For example, there were shortages of chromium, tin and zinc. As a result cadmium plating became increasingly common.

Cadmium Plating Dangerous Cadmium plating is a useful protective coating for metals; but, it is also dangerous to human health and life in certain applications. The Indiana State Department of Health discovered that cadmium plated steel pipes when heated, irrespective of the cause or reason, give off yellow-brown poisonous fumes which are injurious to workmen's lungs. In fact the Indiana State Health Department pointed out that when workmen inhale such fumes over a long period of time, it causes death.

Effect of Cadmium Plating on Welders Now take the cases of some Pacific Coast shipyards during the war. They observed that some of their welders complained of suffering from serious discomfiture. An investigation was made by the California Bureau of Industrial Health. After carefully observing welders at work on different classes of welding it discovered that only those became ill who welded cadmium plated ship parts.

Servicemen Affected by Cadmium Plating No one would be so ridiculous as to accuse electroplaters of wilfully causing suffering to men in our armed services. And yet in their innocence some of them did contribute to the suffering of some marines in different areas and to a large percentage of the crew of one destroyer. This occurred when these service men used some cadmium plated food containers. The cadmium plating did not have any affect on the dry food. But when the servicemen used these containers as lemonade drinking cups they became very ill because the acid from the lemonade released enough of the plating to cause those servicemen to suffer from cadmium poisoning.

Caution Should Be Used in Plating Refrigerator Parts Here is another example of how cadmium plating causes people to suffer. During the war, after a number of persons in New York City were found to be suffering from cadmium poisoning that city's health department warned all local electroplaters not to use cadmium in plating anything which comes in contact with foodstuffs. In making its investigations, among other things, New York's Health Department discovered that cadmium plated evaporator units of refrigerators which are located above food and ice compartments are dangerous because a slight leakage of sulphur dioxide from the refrigerator will cause cadmium plating to peel, scale or dissolve and then drop into ice cube trays and onto foodstuffs.

Electroplaters Will Do Their Part All of this points to the condition that electroplaters' responsibilities must not be taken lightly. During an emergency, or no emergency, they should not electroplate any article with cadmium if they know it will come in contact, in any shape of manner, with foodstuffs, or if they believe it may be inadvertently used to cause cadmium poisoning. Health departments feel sure that electroplaters will cooperate with them to help preserve human health and life.

CPA Describes Advantages and Consumption of Cadmium The Tin, Lead and Zinc Branch of the Civilian Production Administration on June 6, 1946, issued a statement which said that "cadmium finds its greatest use in electroplating. Compared with zinc, some of the advantages it offers are: coatings one-third as thick give equal protection, the rate of deposition is virtually double, parts are more easily soldered, higher electrical conductivity, less current required, holds brightness longer, and tends to prevent seizure of threads in screws, bolts, etc. The metal is used extensively in bearings because cadmium-base bearings are stronger than babbitt. Cadmium is also essential in producing the low melting point and high fluidity of silver solder." At the same time this branch of the CPA revealed that the use of cadmium for electroplating increased from 3,692,000 pounds in 1940, to 4,586,000 pounds in 1941, to 6,661,000 pounds in 1942, to 6,481,000 pounds in 1943. In 1944, the consumption by the electroplating industry dropped to 5,278,000 pounds. And during the first six months of 1945, the cadmium consumption by electroplaters totaled 2,560,000 pounds.

The Bureaucrats of Washington Representative Daniel A. Reed of New York to members of the House made this observation: "I want to call to the attention of the House what I consider to be a very

serious situation so far as this Government of ours is concerned. I had always supposed that this Government was the result of the sovereign will of a sovereign people. We have now developed a situation here where this seems to be a Government of the bureaucrats, by the bureaucrats, and for the bureaucrats. It is getting to be so now that a citizen cannot even get a bureaucrat to answer the telephone. He is always in a meeting or he has gone to lunch. He refuses to call back even when he has an opportunity to do so on matters of great concern to industry and to labor, both. I have been going through that experience, and I am getting tired of it, and I think that this House, if it has any spine left, ought to put these men in their places. I refer to the OPA in particular."

How to Deal with Washington Bureaucrats William K. Jackson, president of the Chamber of Commerce of the United States, in a recent address gave this advice on how to deal with Washington bureaucrats. "Whether right or wrong," said Mr. Jackson, "the so-called Washington bureaucrats have a job to do. Some of them are sincere and many of them are impractical crusaders. So we must deal with them, for better or worse. But we can be practical. We can lay our cards on the table and work towards cooperation. We should educate them, . . . not antagonize them. Head on collisions between us should give way to cooperative understanding and a determination to work out problems, even though it does take a degree of patience we are not accustomed to use."

Steel May Be Nickel Plated Without Electric Current The National Bureau of Standards has developed a process which makes it possible to nickelplate steel without the use of an electric current. The Bureau says that "the deposition is brought about by the chemical reduction of a nickel salt with hypophosphites. The reaction is catalyzed by steel and nickel, and deposition of nickel occurs only on the surface of these metals." The process was developed by Dr. Abner Brenner, president of the Baltimore-Washington Branch of the American Electroplaters' Society and Miss Grace E. Riddell of the Bureau of Standards and only woman member of the Baltimore-Washington Branch of the A. E. S.

Employment from 1946 to 1950 in the United States The economic experts of the Association of American Railroads make these predictions on prospective civilian employment:

Year	*Civilian Labor Force*	*Unemployment*
1946	54,500,000	7,500,000–12,500,000
1947	57,510,000	5,500,000– 7,500,000
1948	58,010,000	4,000,000– 6,000,000
1949	58,490,000	3,500,000– 5,000,000
1950	58,970,000	3,500,000– 5,000,000

Profit-Sharing Not An Absolute Labor Unrest Cure A recent survey made by the National Industrial Conference Board reveals that profit-sharing is not the cure for labor unrest. After making a study of 161 profit-sharing plans, it found that 60 per cent were abandoned. About 36 per cent were dropped because there were no profits to share. And 24 per cent were discontinued because of employer and employee dissatisfaction largely due to the employees' lack of understanding the principles and their inability to perceive clearly how business cycles affect profits. "The profit-sharing plan," the survey states, "apparently works fairly well as long as the company prospers, but dissatisfaction arises when profits diminish or disappear."

Labor Outlook as Viewed by Wirtz Chairman W. Willard Wirtz of the National Wage Stabilization Board recently declared that "labor cannot be expected to pay decontrolled prices with controlled wages. It can hardly be expected to support an effective wage control program." After making this observation he added: "Twice before within the past 25 years American labor has seen wage increases lag further and further behind price increases, until the economic cord finally snapped—around labor's neck. It will not do that again. Labor may be expected to demand its wage increases this time in anticipation of what the increases in the cost of living are going to be. These demands will not be for 10 or 15 or 20 cents an hour—but for three or five times that amount. The wage disputes and the strikes and stoppages of the next six months again will slow our output—this time to a virtual halt."

President's Labor Legislation Merely a Stop Gap There are many national leaders who feel that failure of the Case Bill to become a law has set the nation adrift. They are of the opinion that even though it may not have been perfect it did offer some hope of reducing disastrous labor conflicts and move us in the direction of establishing a sound national labor policy. The President's emergency legislation, which is making slow progress in Congress, will merely be a stop gap measure without establishing a national labor policy.

Are Government Made Labor Contracts Constitutional? When the United States Government seizes strike-bound private property and enters into a wage agreement with the workers which the owners must accept, by entering into a similar agreement with the workers to get back their properties the question: are seizure contracts legal? is in order. Twenty-six years ago when the Kansas industrial relations court tried to fix the working hours in a packing plant the United States Supreme Court held that "such a system infringes the liberty of contract and rights of property guaranteed by the due process of law clause of the 14th Amendment." Similarly in 1924, the United States Supreme Court in a coal mining case, held that the Kansas law of compulsory arbitration was unconstitutional.

Nickel Monopoly Denied The Justice Department has started a civil suit against the International Nickel Company of Canada Limited, and its American subsidiary on the alleged charge that it is operating a monopoly in restraint of trade. Shortly after being served with a complaint a Canadian spokesman said "the company has no agreement with any of its competitors which prevents their competing with it in the sale of nickel in the United States market or elsewhere. The facts are simply that we produced better nickel and have better served United States users."

Hanson-Van Winkle-Munning Offers New Securities A group of bankers recently offered to the public $1,250,000 in 4½ per cent fifteen year sinking fund debentures and 101,284 shares of common stock ($3.50 par value), of the Hanson-Van Winkle-Munning Company. The debentures were priced at 100 per cent plus accrued interest; and the shares were offered at $10.625 a share. From the proceeds of these issues the company plans to use $606,500 to retire 14,899 shares of first preferred stock at $40 per share plus accrued dividends; about $600,000 will be used to pay the current existing bank indebtedness, and approximately $187,300 will be used for general corporate purposes.

SWPC Report Predicts Future Concentration of Industry The Senate Special Committee on Small Business recently revealed that in a report which the Smaller War Plants Corporation presented to the Committee shortly before its dissolution predicted that the long-range trend toward industrial concentration, which increased sharply during the war, will continue in the post-war period.

Congress Will Be Asked to Authorize Joint Service Procurement Legislation is being drafted which will provide that post-war procurement of the Army and Navy will be on a joint basis. The military services favor this for they are anxious to start on new policies of procurement, which will best serve the interests of both arms of the military.

CPA Orders Still in Force The Civilian Production Administration orders which are of interest to the metal finishing industry and still in force on June 17, 1946, are Lead Chemicals Limitation

Order L-354; Rosin Order M-387; Uranium Order M-285; Lead Order M-38; Tin Order M-43; Cans Order M-81; Antimony Order M-112; Tinplate Scrap Order M-325, and Cadmium control which has been transferred from Order M-389 to PR-28.

Private Concerns to Help War Assets Administration The War Assets Administration has completed plans for the employment of private merchandising organizations in the disposition of its surplus property. These private companies will supplement the WAA's efforts to open up more surplus disposal depots. These companies will be paid a fee which has not been decided upon as yet. The fee, according to different guessers, range from 3 per cent to 10 per cent.

Wormser Says Lead Prices Should Be Increased to Stimulate Production Felix Wormser, secretary of the Lead Industries Association, recently declared that the United States will need 1,000,000 tons of lead annually to meet domestic demands. Then he added that "we shall be fortunate to count on 350,000 tons from domestic mines in 1946." It is his opinion that prices should rise sufficiently to stimulate greater world production.

Dutch Tin Output Will Not Reach Prewar Capacity Until 1948 The Netherlands Government does not expect tin production of the Netherlands Indies to reach prewar capacity operation until 1948.

Brass Mill Production Dropped in 1945 The Copper Branch of the Civilian Production Administration recently revealed that the brass mill production of all products for the year 1945, totaled 3,782,354,000 pounds as compared with 5,013,514,000 pounds in 1944.

Caustic Soda Production Declines The production of caustic soda, the Census Bureau reveals, dropped from 154,349 tons in January, 1946, to 143,145 tons in February, 1946.

WAA Could Sell Five Times as Much Metal War Assets Administration officials are of the opinion that they could sell from four to five times their present inventories of metals if they were not tied by priority claimants.

Copper Prices Increased Amendment 6 to Revised Maximum Regulation 20, effective June 3, 1946 provides for an increase in all groups of copper, copper scrap, copper alloy scrap, tinned copper commercial bronze, red brass, yellow brass, Muntz metal, and nickel silver grades.

Lead Prices Increased by OPA The Office of Price Administration authorized a 1.75 cents a pound increase on primary lead at New York; a 1.75 cents a pound increase on secondary lead; a 1.55 cents a pound increase on lead scrap, and a 1.75 cents a pound on primary and secondary lead.

Brass and Bronze Alloy Prices Increased Amendment 5 to Maximum Price Regulation 202, effective June 3, 1946, provides for producers of brass and bronze alloy ingots an average increase of 15.52 per cent over current ceilings on ingots.

Lead Consumption During the War Years The Civilian Production Administration recently revealed that the domestic consumption of lead amounted to 1,051,602 short tons in 1945, as compared with 1,118,643 short tons in 1944; 1,112,738 short tons in 1943, with 1,043,406 short tons in 1942, and with 1,254,202 short tons in 1941.

Combined Tin Committee Increased Tin Allotments The Civilian Production Administration announced on June 4, 1946, that the Combined Tin Committee has made additional allocation of tin metal to the amount of 9,476 long tons for the first quarter of 1946. Out of this additional allocation the United States was allotted 2,350 long tons; France 2,840 long tons; Canada 1,070 long tons, and the balance between fourteen other countries.

Bolivian Tin Contract Under Negotiation The present contract between the Reconstruction Finance Corporation and the Bolivian tin producers expires on June 30, 1946. Negotiations have been underway for three months for a new contract. The RFC has offered the Bolivian tin producers 62½ cents per pound of tin content, with a bonus of 1 cent per pound for delivery of 115 per cent of the 1943-44 shipments to the United States. On the other hand the Bolivian producers are asking a basic price of 66 cents per pound. When the 1½ cent smelting charge is added, this would bring the price up to 67½ cents a pound.

Shipments of Porcelain Enameled Products Increase The Bureau of the Census reports that the shipments of porcelain enameled products amounted to $6,012,686 in April, 1946, as compared with $3,146,268 in April, 1945, and with $2,753,885 in April, 1944.

Domestic Lead Production Declining Steadily The Civilian Production Administration has revealed that there is no immediate relief in sight in the supply of lead. The CPA pointed out that no important new lead deposits have been discovered in the United States for many years. The domestic lead production has dropped steadily from 453 000 tons in 1943, to 417,000 tons in 1944, to 388,000 tons in 1945.

Zinc Stockpiles Have Been Declining Since February The American Zinc Institute statistics reveal that the stockpiles of zinc have declined steadily from 273,075 tons in February, 1946, to 260,995 tons in March, 1946, to 248,706 tons in April, 1946, to 241,442 tons in May, 1946.

May Production of Copper Increased Over April Output The Copper Institute reports that production of refined copper totaled 20,551 short tons in May, 1946, as compared with 18,989 tons in April, 1946, with 20,139 tons in March, 1946, with 43,584 tons in February, 1946, and with 49,923 tons in January, 1946.

OES Reduces Copper and Lead Subsidies The Office of Economic Stabilization announced on June 11, 1946, the reduction of subsidy payments on copper and lead to the extent of the recent ceiling price increases granted these metals by the Office of Price Administration. The OPA recently increased copper ceiling prices from 12 to 14⅜ cents a pound and lead ceiling prices from 6½ to 8¼ cents a pound.

Thirty Day Inventory on Zinc Now Is Order of Day Priorities Regulation No. 32, as revised on June 14, 1946, by the Civilian Production Administration to provide for a 30 day limit on the inventories of special high grade zinc and prime Western zinc.

Antimony Shortage May Be Eased Some experts are of the opinion that the current acute shortage of antimony will be eased if the OPA goes through with its proposal to raise the ceiling from 14½ cents a pound to 23 cents a pound.

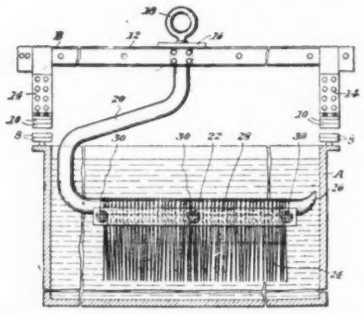
Cadmium May Be Decontrolled by OPA to Stimulate Use of Substitutes In the near future the Office of Price Administration may decontrol cadmium. Government experts feel that such decontrol will drive prices upward and encourage users to use substitutes. At present cadmium production is at the rate of about 4,000,000 pounds per annum.

Jewelry Makers Must Observe Tin Order Manufacturers of jewelry and other novelty and luxury items were recently advised by the Civilian Production Administration that they must continue to be guided by the restrictions of Tin Conservation Order M-43 in the output of their products.

Patents

Electrolytic Cleaning

U. S. Pat. 2,398,059. C. K. Turner, assignor to The American Steel and Wire Co. of N. J., Apr. 9, 1946. Electrolytic cleaning apparatus comprising, in combination, an electrically conductive frame, a holder carried by the frame and including a horizontally extending electrically conductive contact arm adapted to receive a bundle of wire to be cleaned, the said arm being sufficiently long to hold the bundle when expanded so that successive coils thereof are separated from contact one with another, adjustable clamping means for the arm extending lengthways thereof, the said clamping means comprising edged bars extending substantially parallel to the arm and adapted to engage all convolutions of the bundle in a substantially line contact for pulling them tightly against the arm, and means for adjustably positioning the bars relative to the bundle being cleaned.

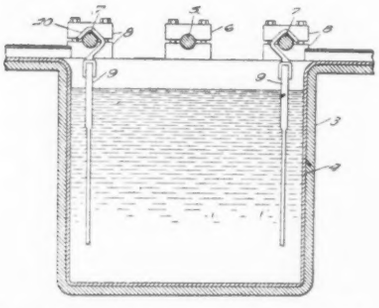


Stripping Anodized Aluminum

U. S. Pat. 2,398,079. J. Janota, Jr., and B. B. Button, Jr., assignors to The Diversey Corp., Apr. 9, 1946. A dry mix consisting essentially of 80% hemi-sodium phosphate and 20% chromic acid.

Chromium Plating Anode

U. S. Pat. 2,398,110. J. B. Niles, assignor to Thomas J. Dee & Co., Apr. 9, 1946. An electrode consisting essentially of 6% to 12% of silver and the balance being substantially all lead and having on a surface thereof a coating of lead chromate and silver chromate having substantially the same conductivity in a chromic acid plating bath as the underlying alloy.

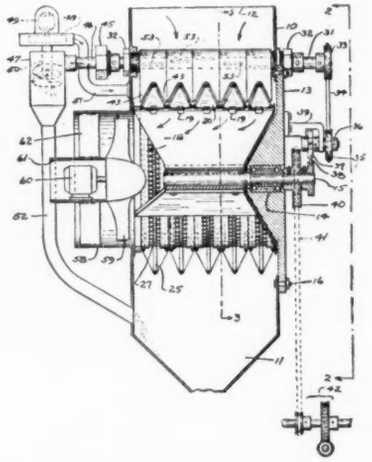


Roughness Measuring

U. S. Pat. 2,397,923. B. A. Coss, assignor to The Brush Development Co., Apr. 9, 1946. In combination, an electrical pickup device of the type including carrier means on which are mounted a movable stylus and means operable by said stylus for generating a fluctuating electrical quantity related to excursions of said point with respect to the carrier means, means for amplifying the electrical quantity, means for limiting the peaks of the electrical quantity at a certain value, means for producing a signal constant in amplitude and varying in duration in accordance with the lengths of time the peaks of the fluctuating electrical quantity are limited, means for integrating said signal with respect to time, and means for measuring the integrated quantity to provide an indication of the percentage of a surface which exceeds a certain roughness value related to the value set on the said limiting means.

Dust Collector

U. S. Pat. 2,398,233. R. L. Lincoln, assignor to B. F. Sturtevant Co., Apr. 9, 1946.



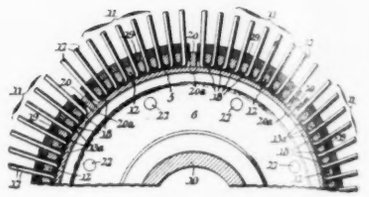
A dust collector unit comprising a pair of substantially similar circular hoops, a third circular hoop having a larger diameter than said hoops, a rotary shaft, means spacing the hoops of said pair and supporting same from, and concentric with, said shaft, and supporting said third hoop between said hoops of said pair and concentric with same, and a sheet of filter cloth stretched over said hoops.

Abrasive Article

U. S. Pat. 2,398,408. H. W. Buell, assignor to The Carborundum Co., Apr. 16, 1946. An abrasive article, the abrading portion of which consists essentially of an adhesive binder and pieces of felted fibrous sheet material containing substantial amounts of abrasive particles internally thereof, said abrasive-containing fibrous pieces being held together in non-stratified, compacted form by the adhesive binder.

Brush

U. S. Pat. 2,398,241. R. N. Miller and W. H. Grindall, assignors to The Pennsylvania Railroad Co., Apr. 9, 1946. A brush having a rigid foundation element; a perforated bristle anchorage member detachably secured to the foundation element; bristle elements of hairpin configuration with their ends passed through adjacent holes in the perforated anchorage member and their bristle connecting bights securely clamped between said element and said member; and a relatively thick layer of rubber bonded to the outer surface of the anchorage member and penetrated by the bristle ends for yieldingly bracing the latter adjacent their root anchorages.

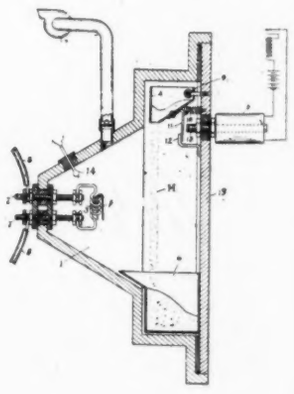


Hot Dipping

U. S. Pat. 2,398,034. K. Oganowski, assignor to The American Rolling Mill Co., Apr. 9, 1946. A process of treating hot coated metal strip prior to the solidification of the coating which comprises contacting the coated strip with a plurality of spaced wiper blades on one side and at least two wiper blades on the other, and positioning the blades so that the strip is deflected from a rectilinear path as it passes between them, and withdrawing the said strip from a bath of molten coating metal between the said blades whereby to cause the blade edges accurately to contact the surface of the strip, some at least of the blades being so configured and positioned as to have faces which form with the strip as it approaches them an angle not substantially less than 90°, and positioning at least one blade on each side of the strip beneath the surface of the molten coating metal while positioning at least one other blade on each side of the strip above the surface of the molten coating metal.

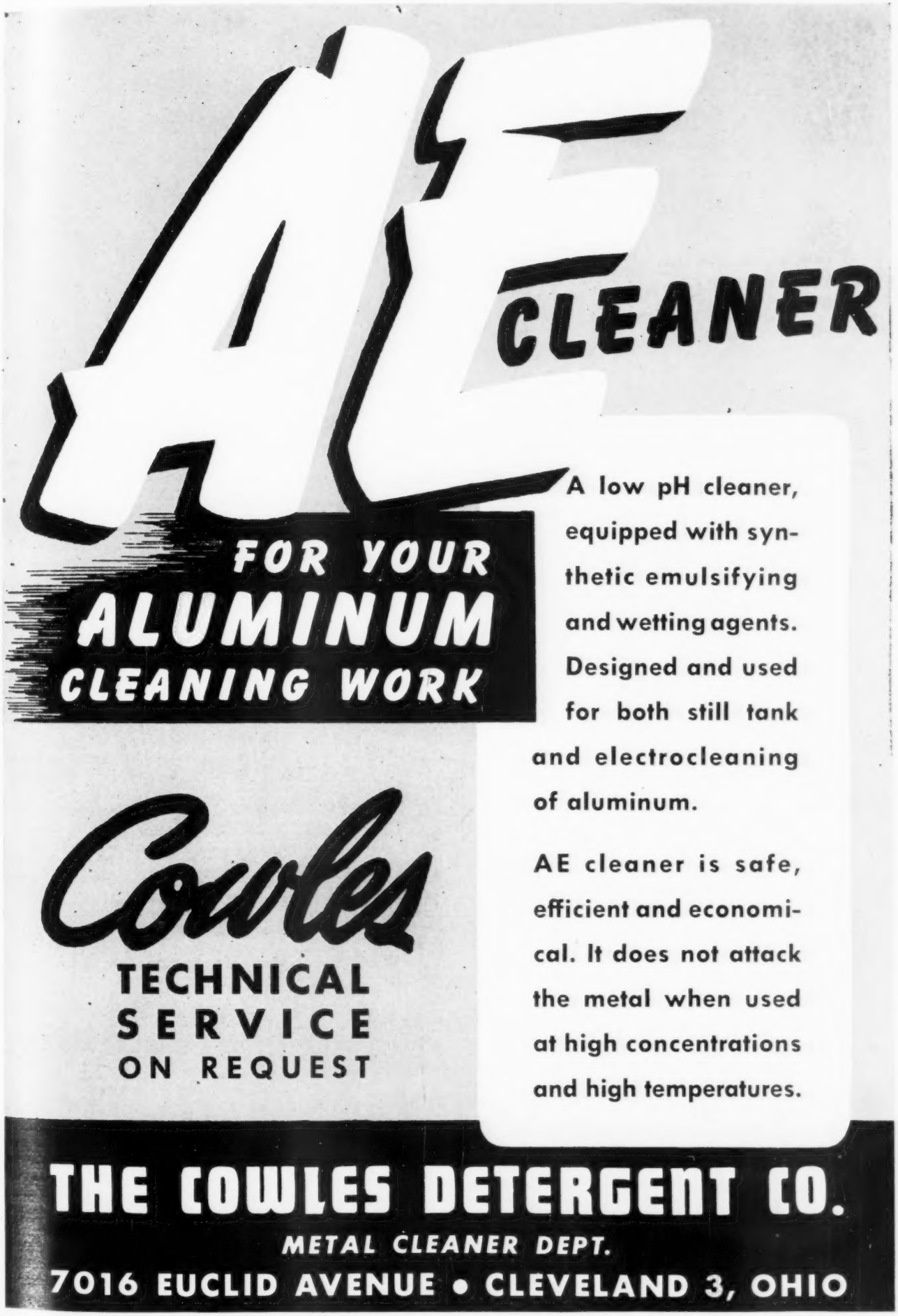
Vapor Metallizing

U. S. Pat. 2,398,517. W. W. Castor, Apr. 16, 1946. An apparatus of the class described for coating finely divided particles with metal comprising a chamber, means for evacuating air from the chamber, means for generating a metal vapor in the chamber, and means within the vessel for holding and sifting finely divided solid material into the vessel to cause it to fall through the vapor.



Vitreous Enamel

U. S. Pat. 2,398,494. A. J. Deyrup, assignor to E. I. duPont de Nemours & Co.


AE
CLEANER
FOR YOUR
ALUMINUM
CLEANING WORK
A low pH cleaner, equipped with synthetic emulsifying and wetting agents. Designed and used for both still tank and electrocleaning of aluminum.
AE cleaner is safe, efficient and economical. It does not attack the metal when used at high concentrations and high temperatures.
Cowles
TECHNICAL
SERVICE
ON REQUEST
THE COWLES DETERGENT CO.
METAL CLEANER DEPT.
7016 EUCLID AVENUE • CLEVELAND 3, OHIO

Apr. 16, 1946. The process of improving the smoothness and gloss of a fluorine-containing enamel when fired and matured on an article to be coated or decorated, which comprises, fritting the said fluorine containing enamel, and then heating said coarse fritted enamel, before the same is ground to a size used in firing, to a temperature within its annealing range but below the temperature at which the particles soften and stick together for a period long enough to insure all portions of said fritted product reaching a temperature within said range.

Plating Carbide Powders

U. S. Pat. 2,398,132. W. P. Cottrell, Apr. 9, 1946. The process which consists of grinding carbides into particles of suitable size, rotating the said ground particles and simultaneously electroplating the particles of carbide completely and evenly, then drying the electroplated particles, combining the carbides with a deoxidizing flux, then pressing said carbides into a suitable shape, then electroplating to fill up the porous material with pure ductile metals, casting steel around the coated pressed shape, and finally heating and pressing the cast blank into finished shape.

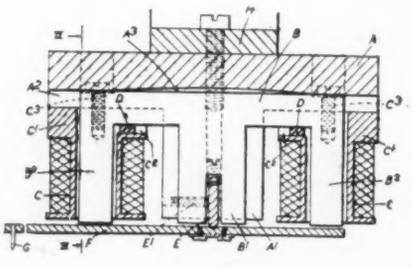
Manganese Plating

U. S. Pat. 2,398,614. W. E. Bradt and H. H. Oaks, assignors to Vanadium Corp. of America, Apr. 16, 1946. The process of producing manganese, which comprises electrodepositing manganese from an aqueous solution containing manganese sulphate, said solution also containing an ammonium salt of the group consisting of ammonium sulphate and ammonium chloride, said solution being substantially free from other depositable metal salts, at a cathode current density of about 20-30 amperes per square decimeter and a temperature of about 15-30° C., and regulating the pH value of the solution between about 4.0 and 5.5.

As an article of manufacture, a plate of electrodeposited manganese of approximately 100% purity, which in thick deposits over 0.1 mm. in thickness and up to at least 0.3 mm. in thickness is smooth, adherent, silver-white and devoid of crystals visible to the unaided eye.

Roughness Measuring

U. S. Pat. 2,398,666. R. E. Reason, assignor to Taylor, Taylor & Hobson, Ltd. (England), Apr. 16, 1946. For use in apparatus for measuring or indicating the roughnesses or undulations of a surface, of the kind in which a stylus is traversed over the surface and its movements approximately normal to the surface during such traversing are utilized electrically to control a measuring or indicating instrument, a differential electromagnetic detector device comprising a non-magnetic supporting framework, a magnetic core formed or E-shaped laminations, two bobbins carrying the coils of the device and respectively surrounding the outer limbs of the core, means for applying a clamping force to the bobbins and framework in the direction of the length of the limbs of the core thereby gripping the crossbar of the core between them in a direction edgewise to said laminations, and an armature cooperating with the core and carrying the stylus.

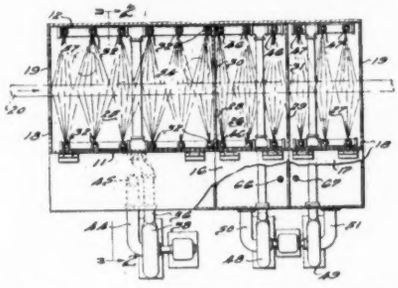


Corrosion Prevention

U. S. Pat. 2,398,202. E. W. Zublin, E. R. White and E. R. Barnum, assignors to Shell Development Co., Apr. 9, 19466. A corrosion-preventive composition comprising predominantly an oleaginous vehicle containing finely dispersed a small corrosion inhibiting amount of a dicarboxylic acid having at least 16 carbon atoms, the two acid radicals in said acid being linked through an element selected from the group consisting of S, Se, and Te, said element being attached to a carbon atom not further removed from the carboxyl radical than the beta position.

Cleaning Zinc

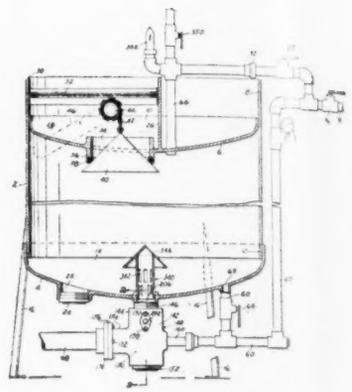
U. S. Pat. 2,399,267. B. J. Szatyn, assignor to Solventol Chem. Prod., Inc., Apr. 30, 1946.



The method of removing buffing compounds from metal parts containing zinc in preparation for electroplating such parts which comprises dipping said parts into a grease solvent and thereafter spraying the parts with a mechanically combined unstable mixture of an emulsion of grease solvent and water and an unemulsified excess of said solvent, collecting, re-mixing, and re-circulating said mixture through the cleaning spray, and maintaining the pH of said emulsion at a point within the range of approximately 2.0 to 3.5.

Sandblasting Apparatus

U. S. Pat. 2,399,385. J. W. Rasmussen, Apr. 30, 1946. In a sand blasting apparatus having a valve connection of the class described connected to the sand blasting apparatus and adapted for controlling the air and sand inflow therethrough, comprising, a housing, a sand reservoir in said housing, an air inlet passage in said housing for supplying the air into said sand and passing into said valve at a pressure, a slotted nipple means having a conical hood for controlling the flow of said sand into said valve connection, a control passage means disposed in said housing and in close proximity to the air discharge of said housing, and a sidewardly movable block valve means in said



control passage for regulating the volume of sand passing therethrough and out of said sand blasting apparatus and for preventing the bridging of said sand therein.

Phosphate Coating

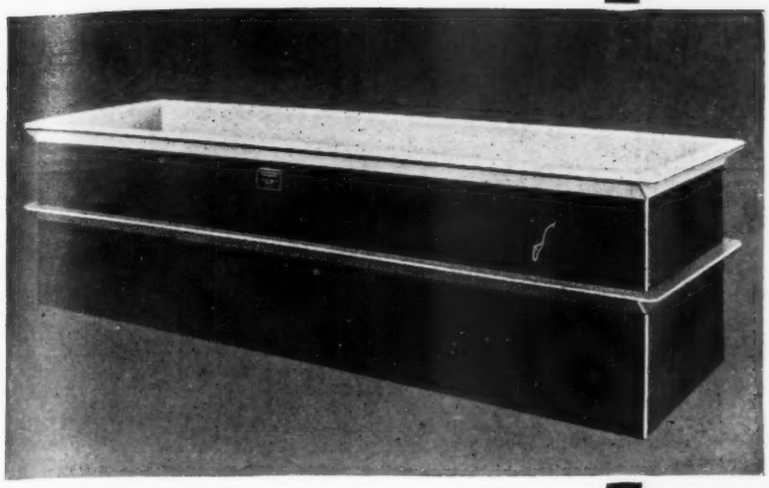
U. S. Pat. 2,398,212. C. B. Durgin, assignor to Monsanto Chem. Co., Apr. 9, 1946. The process for inhibiting the rusting of a cold reduced steel sheet which comprises wetting said sheet with a substantially pure phosphoric acid solution, removing said sheet from said solution and thereupon passing it through squeeze rolls to remove excess acid, correlating the temperature and concentration of said acid with the action of the squeeze rolls and also the time of contact of said acid with said sheet prior to passage through said rolls to form upon said steel sheet a uniform adhering film of said acid containing between 0.015 and 0.040 gram of P_2O_5 per square foot of surface and thereupon reacting said film of acid with said steel sheet to form a substantially invisible elastic paint-, lacquer- and enamel-bonding coating which imparts rust-inhibiting properties to said steel sheet without substantially impairing its natural bright metallic lustre.

Coating Aluminum

U. S. Pat. 2,398,712. W. J. Malcolmson and R. V. Miner, assignors to Western Electric Co., Inc., Apr. 16, 1946. A method of producing an article of aluminum having a coating of noble metal thereon which comprises anodizing the surface of the article, coating the article with an organic compound of a salt of a noble metal, and then heating the coated article to decompose the compound.

Coating Aluminum and Magnesium

U. S. Pat. 2,398,738. H. N. Gilbert, assignor to E. I. duPont de Nemours & Co., Apr. 16, 1946. A process for applying a metal coating to a metal base having a surface composed at least preponderantly of a light metal selected from the group consisting of aluminum and magnesium comprising contacting said base with a fused salt bath comprising a halide of a metal selected from the group consisting of those copper, lead, and silver halides which melt at temperatures below about 650° C. and thereafter removing residual metal halide from the coated base by immersion in a fused bath comprising a solution of alkali metal hydride in alkali metal hydroxide, followed by washing with water.



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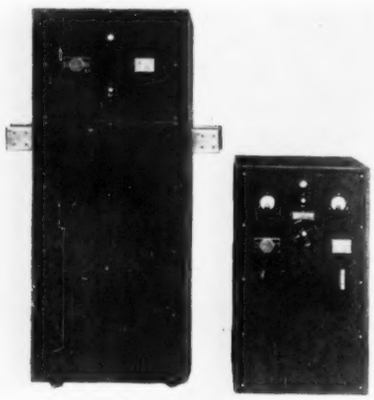
Rubber Processing

NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY



Variable Platers

Nine models of large variable platers are being manufactured by the Richardson-Allen Corp., Dept. MF, 15 West 20th St., New York, N. Y. The machines are furnished either as basic units with separate remote control, as illustrated, or as self-contained units with meters and stepless variable auto-transformer. The specifications for these models are 6 volts-500 amperes, 6 volts-1000 amperes and 12/6 volts-500/1000 amperes. The basic units are approximately 24 inches square by 60 inches high and the remote control units are approximately 36¾″ high, 21″ wide and 15″ deep. A long life selemium rectifier designed for 220 or 440 volts, 3 phase, 60 cycles is employed.

Further information is available by writing to the company.

Metal Cleaners

First production of two new products, Pennsalt Cleaner A-22 for aluminum alloys and PM-95, an acid base cleaning and descaling compound, were announced by the Pennsylvania Salt Manufacturing Co., Dept. MF, 1000 Widner Bldg., Philadelphia 7, Pa.

Pennsalt Cleaner A-22 is a general purpose soak tank cleaner for use on all aluminum alloys. Most common applications are cleaning aluminum before anodizing, chromodizing, phosphatizing and other prepainting treatment and before deoxidizing and subsequent spot welding.

Pennsalt PM-95 is a specially prepared cleaning and descaling compound containing additional agents for surface action and inhibition. Suggested uses are general pickling and metal descaling, especially for difficult-to-remove oxides resulting from heat treating or annealing.

Self-Emulsifying Solvent

A new self-emulsifying, water-mixable solvent, called Oakite Composition No. 98, that removes light shop dirt and non-pigmented stamping compounds from steel and aluminum work, has been made available by Oakite Products, Inc., for use primarily in pressure-spray washing machines.

Non-toxic, non-inflammable in solution, the new material is reported to have important self-cleaning properties and employs the principle of "constant-float" protection. The lighter-than-solution soil floats at the top of the cleaning tank to blanket and protect the clean solution underneath, retard foaming, and prevent material loss by evaporation. The "floating layer" is periodically skimmed or caused to overflow to avoid excessive thickening. The new solvent also prevents formation on clean work of water spots, which often show through clear lacquer and other types of organic finishes.

Field tests conducted during the past year in metal-cleaning operations indicate that working concentrations for the composition range from one to two per cent by volume and maximum temperatures should not exceed 150° F.

A free Service Report giving details may be secured by writing on company letterhead to Oakite Products, Inc., Dept. M.F., 26 Thames St., New York 6, N. Y.

Industrial Clothing

Addition of a Koroseal work and acid suit to its line of industrial clothing is announced by the B. F. Goodrich Co., Dept. MF, Akron, Ohio. Koroseal is the flexible plastic material developed by the company which found extensive application in the war effort and is now being used in a wide variety of consumer and industrial products.

Made from best quality textile sheeting,

PROFESSIONAL DIRECTORY

Any plating bath analyzed for $2.00. Standard reagents for analysis made to order.

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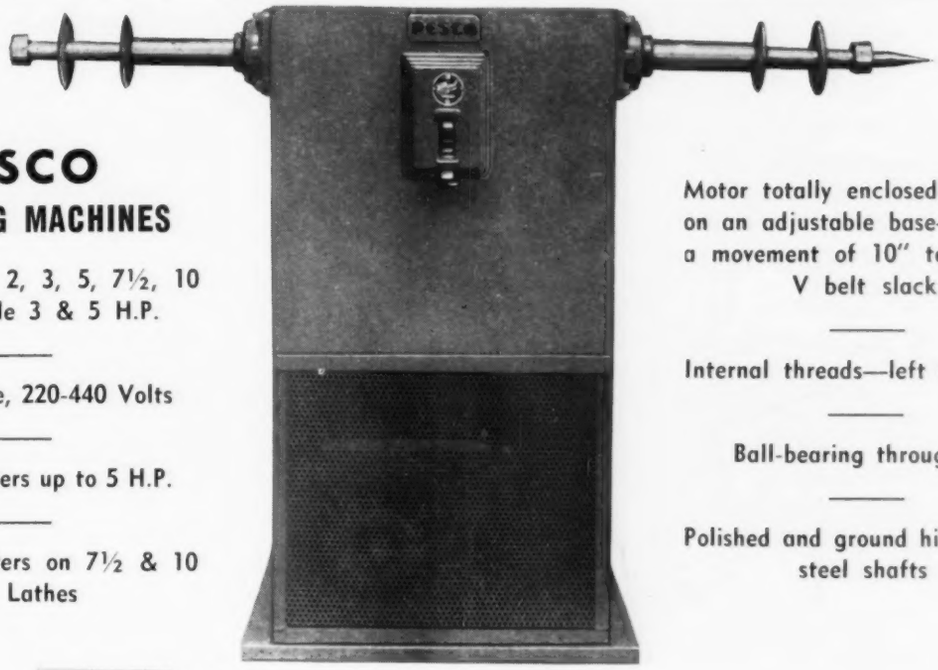
MODERNIZATION OF EXISTING PLATING DEPARTMENTS

DESIGN AND ESTABLISHMENT
of
NEW AND MODERN
PLATING DEPARTMENTS AND BUSINESSES



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POLISHING MACHINES

Sizes—1, 1½, 2, 3, 5, 7½, 10 H.P. Double 3 & 5 H.P.

A.C., 3 Phase, 220-440 Volts

Manual Starters up to 5 H.P.

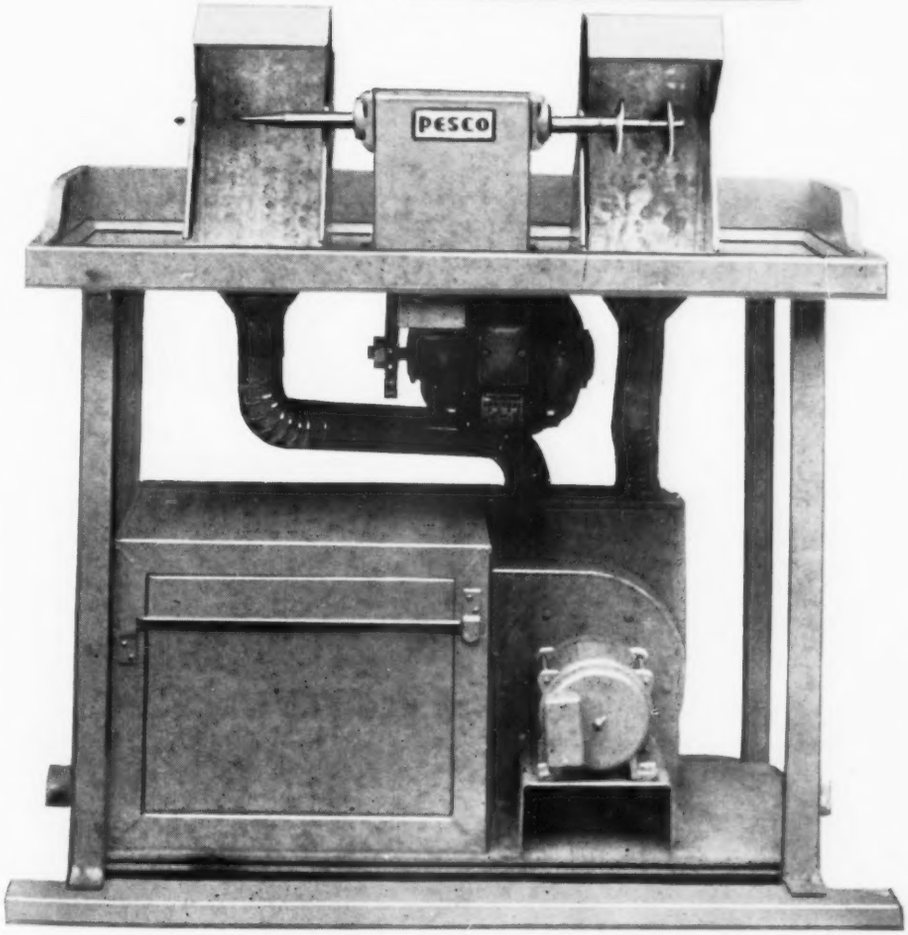
Magnetic Starters on 7½ & 10 H.P. Lathes

Motor totally enclosed, mounted on an adjustable base—allowing a movement of 10" to take up V belt slack

Internal threads—left and right

Ball-bearing throughout

Polished and ground high carbon steel shafts



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Sizes—1 and 2 H.P. Motor Drive

Spindle Speeds, 1200-2900 R.P.M.

Shafts—Straight or Tapered

Static Pressure of 2" at the Hoods

Individual Motor Drives for the Polishing Spindle and the Blower

Velos Belt Drive on PESCO No. 1 Table to Take Out Belt Slack

Motor Mount (Adjustable) on PESCO No. 2 Table to Take Up Belt Slack

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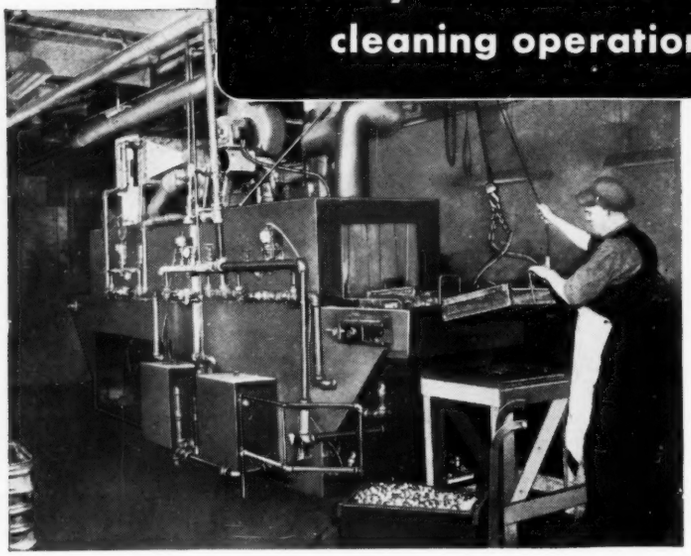
For HIGH OUTPUT on many difficult metal parts cleaning operations



OPTIMUS Flat Conveyor Type Spray Washing Machine handling brass screw machine parts and castings in bulk in large metal working plant.

THE OPTIMUS Flat Conveyor Type Spray Washing Machine will handle metal parts of almost any shape. It can be adapted to many different and difficult metal cleaning problems.

The output of this OPTIMUS Machine is high, with little labor required for loading or servicing. Most types of parts can be easily handled in it in bulk in baskets or separately on the conveyor. Special parts can be positioned, if necessary.

SEND FOR NEW ILLUSTRATED BULLETIN

Write today on your business letterhead for your copy of this new illustrated bulletin describing OPTIMUS Equipment and Dependable OPTIMUS Detergents for modern metal parts cleaning operations.

Handling a large amount of cleaning per square foot of floor space, this OPTIMUS Machine can be used for any metal cleaning or similar operations; alkaline, acid, solvent type, air drying, oil spray, etc. Available in all sizes with any type of horizontal conveyor.

An OPTIMUS Plan for the mechanized handling of your metal parts through washing, rinsing, drying and allied process operations, can help save labor costs, reduce rejects and increase your production. Investigate how the use of OPTIMUS Equipment and the accompanying Dependable OPTIMUS Detergents can be applied to your operations to your advantage.

OPTIMUS EQUIPMENT COMPANY

ENGINEERS AND MANUFACTURERS

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STANDARD AND SPECIAL TYPES OF EQUIPMENT FROM THE SMALLEST TO THE LARGEST SIZES FOR A WIDE VARIETY OF OPERATIONS.

OPTIMUS EQUIPMENT

FOR WASHING · RINSING · PICKLING AND DRYING OF METAL PARTS

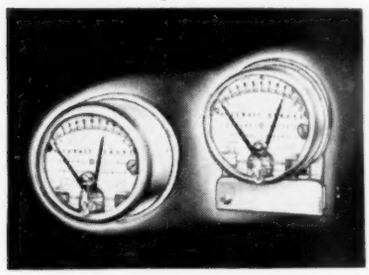
coated black with plastic, the suit has been designed for maximum lightness and toughness, including resistance to abrasion and practically all solvents and acids.

Jackets and pants are furnished separately or as a unit. The jacket has a fly front with concealed ball and socket fasteners, strapped armholes and seams and stand-up collar. Pants are the bib type with adjustable shoulder straps in the back.

Thermal Watt-Demand Meter

A new thermal watt-demand meter, operating on the "direct-heat" principle and known as Type HI-1, has been announced by General Electric's Meter and Instrument Division, West Lynn, Mass. The "direct-heat" principle is based on the use of temperature-sensitive, bi-metallic spirals that act as their own heaters, thus increasing the life and accuracy of the meter while minimizing the need for maintenance.

Since there is no loss of efficiency in the transmittal of heat, the "direct-heat" construction results in inherently greater operating torques, thus allowing the use of larger and more sturdy parts and insuring initial and sustained accuracy. The temperature-sensitive elements are attached directly to a shaft and gear. As the electric energy flows through the thermal element, the



heat produced causes the spiral to deflect, thus rotating the shaft and gear, which drives a red pusher pointer. Maximum demand is indicated by a black pointer, which is pushed up-scale by the red pointer.

The "direct-heat" principle has also been applied to a true single-phase, kva demand meter, which is only the second in a whole new family of thermal demand meters. Other types of these meters, using the same principle, are at present in the development stage.

The meter is housed in a glass case, coated on the inside except for the circular front opening, to promote uniform heat distribution within the meter and to aid in reducing negligible effects of variable external temperatures. It is provided with a manually-operated reset device, by which the black pointer can be turned down to contact the red pointer. The scale, designed to give maximum legibility and ease of reading, conforms to the latest standards approved by the joint committee of E.E.I. and A.E.I.C.

Extended tests of the effectiveness of the design of this new thermal watt-demand meter were possible during the war period while manufacturing facilities were engaged in war work. It has given uniformly good

results in both the laboratory and under actual service conditions.

Detailed information on the new meter is contained in bulletin GEA-4541, available on request to General Electric Co., Dept. MF, Schenectady 5, N. Y.

Cleaning Tanks

Two new models of motor block cleaning tanks specifically designed for the degreasing of diesel motors, truck, tractors and similar larger motor blocks have been released by Aeroil Products Co., Dept. MF, West New York, N. J.

Both models are used in connection with the hot dip alkali cleaning process. The units are fully insulated and heated from the inside by means of a patented removable immersion tube system with the burner in a burner "well" within the fully insulated tank. Because of this factor, the manufacturer claims savings with this equipment of at least 50% in time, labor and fuel as compared with ordinary bottom fired heating.

Standard equipment includes built-in dial thermometer, heavy duty removable grilles, scum gutter, sludge drain, draw-off cock, and double braced hinged covers. Provision is also made for automatic heat controls for thermostatic temperature regulation from 100° to 550° F.

The equipment may be heated by city gas, manufactured gas, liquefied petroleum gas or kerosene. Thermostatic controls are electrically operated from any normal lighting circuit.

The new Model 25T features a normal dipping capacity of 270 gallons with a dipping space 54" long x 38" wide x 30" deep. The inner shell of this tank is manufactured of 14 gauge steel.

The new Model 34T features a dipping space of 60" long x 38" wide x 36" deep with a normal dipping capacity of 355 gallons. This unit is manufactured of 12 gauge steel.

Complete details of specifications, performance data, X-ray diagrams, etc., covering these two new pieces of equipment are available in new literature just issued by the manufacturer. Mailed free upon request to the manufacturer.

Electric Hoist

The Yale line of Midget King electric hoists now includes a 2-ton model. Formerly the unit was available only in ⅛, ¼, ½ and 1 ton capacities. The new size Midget King fits into many industrial applications where, heretofore, heavy-duty electric hoists were employed.

Light in weight, yet producing plenty of fast lifting power, the compact 2-ton model is equipped with a 1 H.P. motor. Lifting and lowering action is obtained by a flip of the wrist on the one-hand bar-grip control. The hoist operator thus has his other hand free to guide the load.

To carry the load, a strong, light weight alloy steel roller chain is used. The load hook is of special steel which provides maximum safety for both load and worker—opens slowly without fracture before any other part of the hoist is strained to the yield point.

Upper and lower limit safety stops prevent overtravel of the hook. The load brake and independently acting motor brake operate whether the power is on or off; both brakes, all wiring, and the controller are totally enclosed.

The shaft and all gears are alloy steel, forged and hardened for maximum strength and long life. Precision bearings are used throughout. Oil bath lubrication protects all frictional parts against wear.

The hoist is available with hook for stationary use and with a permanently attached trolley for use on an overhead track. Accessories include a chain container for collecting slack chain, eliminating kinking and keeping the chain away from the worker and the load. To provide automatic electric cord support and feed when the hoist is used on a trolley, a special device is available. Complete specifications and prices given in catalog P-577. Write The Yale & Towne Mfg Co., Dept. MF, 4530 Tacony St., Philadelphia 24, Pa.

Anodizing Rack

Special Chemicals Corp., Dept. M. F., 30 Irving Place, New York 3, N. Y., has announced that the Spec-o-rack, an aluminum anodizing rack, is now available. The company claims that thousands of these racks were used for anodizing in the production of war materiel and, due to sturdy and precision construction, gave the anodizing life expected under severe treatment. The rack is equipped with a take-up hand bolt which assures positive contact.

The company will supply further information and prices upon request.

3 FAST DRYING STOP-OFFS

THAT HELP CUT PREPARATION TIME

Dry at Room Temperature in 5 to 15 Minutes!

The fast-drying properties of Unichrome stop-off lacquers permit substantial increases in plating output by minimizing the time required for preparing the work for production. Initial coats dry in 5 to 10 minutes—final coat, 15 minutes. They're easy to apply too, by conventional methods of brushing, spraying or dipping.

As the result of years of research and detailed studies of actual plating-room requirements, the Unichrome Laboratories have developed these *three* stop-off lacquers—each designed to offer maximum convenience and performance under specific conditions.

All assure clean-cut edges—withstand hot cleaners and acid dips—and will not contaminate plating baths.

Write for prices and data.

"Quick Dry" Stop-Off 322 (Black)—Excellent for severe plating cycles, including those containing hot cyanide solutions. Can be dissolved in Unichrome Remover 322-RA.

"Quick Dry" Stop-Off 323 (Red)—Excellent for Chromium and other moderate temperature plating. Can be readily pulled off in large sheets at room temperatures.

"Quick Dry" Stop-Off 324 (White)—Excellent for hot cyanide silver and copper solutions. Resists hot electrolytic alkaline cleaners—vapor degreasers for limited time. Can be peeled off while work is still warm.

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PROCESSES AND MATERIALS FOR SURFACES THAT SURVIVE

Chromium Plating · Porous Chromium · Unichrome* Copper · Unichrome Lacquers · Ucilon* Protective Coatings · Unichrome Stop-Off Lacquers and Compounds · Unichrome Dips · Unichrome Rack Coatings · Anozinc* Compounds · Unichrome Strip

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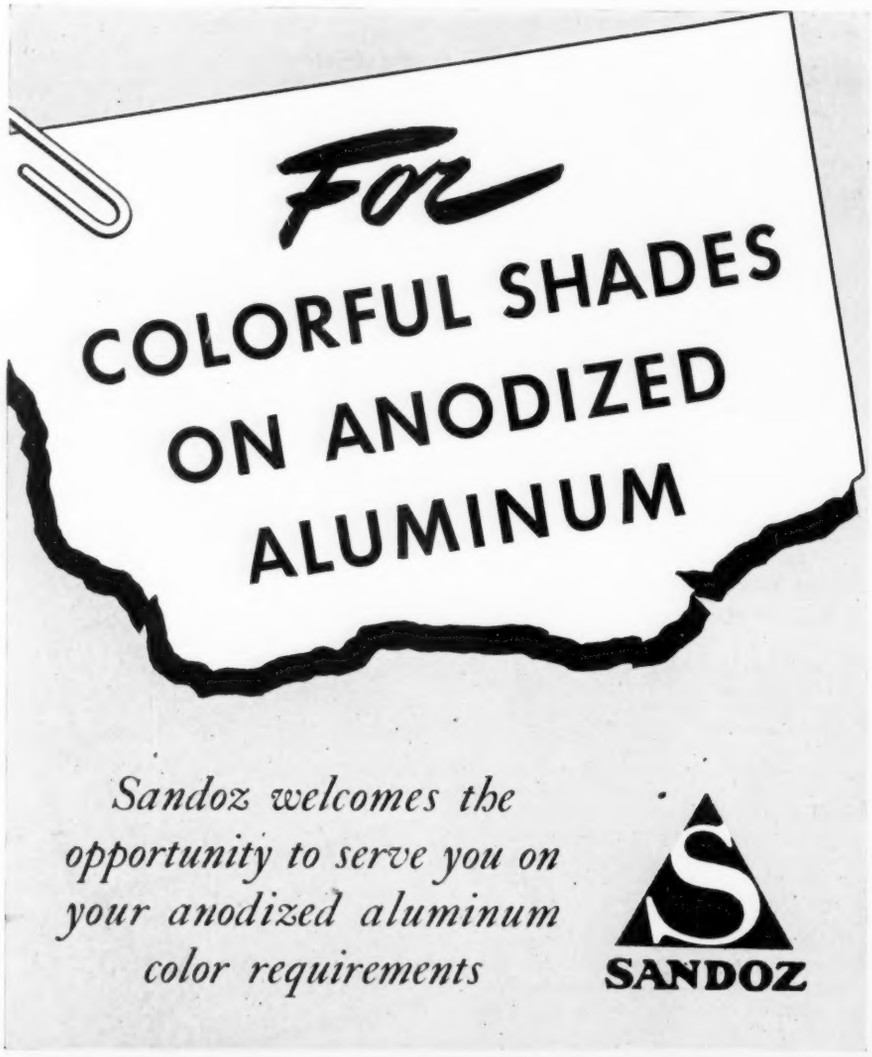


SANDOZ CHEMICAL WORKS, Inc.

61-63 VAN DAM STREET, NEW YORK 13, N.Y.

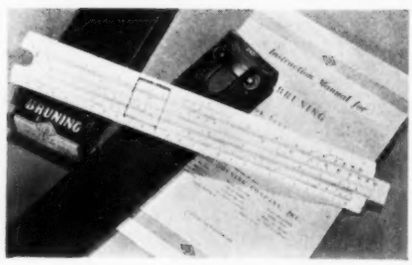
Slide Rule

To fill the need for a slide rule of greater dimensional stability, the Charles Bruning Company has recently introduced a new 10-inch Slide Rule.

This new slide rule is made of a plastic material that is said to have remarkable dimensional stability. The precision graduations are not affected by temperature change. The glass indicator is mounted in a polished stainless steel frame that holds it firmly in place.

The graduations are precise and will not lose visibility through use. The CI scale shows numerals and gradations in red to provide ease of reading. To permit the widest possible range of service, A, B, CI, C, D, K, S, L and T scales are shown on the rule. The beveled edges of the rule are graduated in inches and centimeters.

This new 10-inch slide rule is smooth



working for fast and easy operation. Because of its all-plastic construction, binding or sticking of the slide under varying atmosphere conditions is eliminated. The tension on the slide is easily adjusted by four screws on the back of the rule. The indicator glass may be readily replaced in the event of breakage.

For further information write to Charles Bruning Co., Inc., Dept. MF, 4754-10 Montrose Ave., Chicago 41, Ill.

Rust Preventing Agent

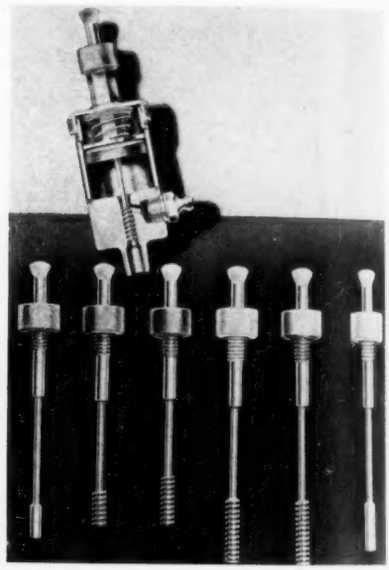
Pennsylvania Salt Manufacturing Co., Dept. MF, 1000 Widener Bldg., Philadelphia, Pa., has announced a new rust preventing agent for use in water on ferrous metals before they are painted, enameled or between machine operations.

The product, packaged in 25, 100 and 300 pound fiber-pak drums, is Pennsalt RI-50, an inorganic salt mixture used in water solution to give temporary rust protection on metal parts during processing.

It is used as a water solution with a concentration of two to four percent Pennsalt RI-50. It is designed for protecting metals for short periods such as after cleaning and prior to painting or enameling. It requires no rinsing before painting.

Lubricators for Industrial Bearings

Manufacturing rights on Gun-Fil Lubricators for industrial bearings have been



acquired by the Gray Company, Inc., Dept. MF, 60 Eleventh Ave., Minneapolis, Minn., manufacturers of lubricating equipment.

Designed in four sizes, with lubricant capacities ranging from ½ ounce to 8 ounces, these pressure filled lubricators automatically dispense oil or grease in a measured, uniform flow to a moving bearing, and stop feeding lubricant when a bearing becomes motionless.

These lubricators assure controlled lubrication over a long period of time. The time between refilling is extended considerably over the periods required by conventional pressure fitting or grease cup methods, effecting labor savings.

Six interchangeable valves are available with distinctive colored caps for identification. The valves with colored caps exert varying degrees of control of feed on greases of different densities.

Feeding the *precise* amount of lubricant to each individual bearing, according to its needs, is the chief advantage claimed.

Semi-Skids and Jacks

An entirely new line of semi-skids and

jacks has been announced by the Market Forge Co., Dept. MF, Everett, Mass. The unit is entirely of steel with a high tensile steel deck. The unusual feature is the fact that steel lumber, in effect, replaces the ordinary wood deck.

The all-steel semi-skid is a completely fabricated and arc-welded arrangement, dispensing with all nuts, bolts and rivets with the exception of the through bolts which anchor the rear wheels. It is designed

in such a way that it may be used with a hand or power lift truck, as there is a clear space underneath the deck and between the side members for the entrance of the lifting devices from either end. The rear wheels are substantially mounted in steel supports which straddle the wheel, thus eliminating any source of difficulty due to bending of the axle.

The wheels are 8″ in diameter and are mounted on roller bearings with hardened inner races. Side members consist of Z bars, which add strength to the structure. The units are usually 15% to 20% lighter than conventional types with wood deck.

The jack itself is a substantial unit equipped with two 8″ diameter wheels mounted on roller bearings with a hardened axle. A unique hook arrangement allows the load to be easily lifted even when heavily laden. More than 1″ of lift is provided for the front legs, allowing it to travel over ordinary obstructions. All-steel, light-weight box sections of the nesting type can also be furnished to retain loads.

Market Forge Semi-Skids and Skid Jacks are available with wheels of semi-steel, plastic, cushion rubber and aluminum.

Announcing
AMERICA'S FASTEST SERVICE . . .
COATING PLATING RACKS
with a NEW WONDER COATING
Send racks by truck . . .
A NEW MODERN PLANT designed specifically for the fabrication and coating of plating racks with every known device to facilitate large volume and meet heretofore impossible delivery schedules on any quantity of racks to be coated.
A NEW WONDER COATING—known as MICCROPLASTIC—meets the requirements of all plating cycles, including chromium—resists all acids and alkaline cleaners—has the characteristics of live rubber yet so tough it will often outlast the life of the rack.
Send us 2 or 3 racks—we will coat them with MICCROPLASTIC without charge to demonstrate to you the superior qualities of this new coating. Be sure racks are free from old coatings and loose deposits—chamfer all edges.
48-HOUR SERVICE ON COATING RACKS PRICES QUOTED ON ANY QUANTITY
. . . by rail
. . . by air
MICCRO Products
Developed and Manufactured by Experienced Platers
MICHIGAN CHROME AND CHEMICAL COMPANY
6340 East Jefferson Avenue • Detroit 7, Michigan

Protective Degreaser

Gaybex Corp., Nutley, N. J. has released its Ready-to-Use Emulsifying Degreaser, G-BEX D for general distribution. This product was developed during the war to meet the problems of overseas packaging and steel parts machining as a cleaning and protective agent.

This product is a neutral emulsifying solvent having a minimum flash point of 165°F (ASTM C.O.C.). It is non-irritating to the skin and is considered non-corrosive to all standard construction metals. The manufacturer claims that the degreaser will not strip paint or lacquer and may be used for light or heavy duty degreasing by spray, brush or soak application followed by water rinse.

Consumer trials demonstrate that steel bearings and parts could be safely handled without fingerprinting after being cleaned with this solvent and water rinsed. The slight protective film remaining after the wash persisted for several months.

G-BEX D is available for immediate delivery in 5 and 54 gallon drums, from Gaybex Corp., Dept. MF, P. O. Box 3-D, Nutley, 10, New Jersey.

Non-Overheating Solvent Degreaser

The Mabor Co. of Clark Township, N. J., has developed a production degreasing machine equipped with a liquid jacket heating system which operates at atmospheric pressure. In this way, gentle, uniform heat is provided, thereby avoiding the danger of the solvent overheating and reducing the necessary amount of fluid in the equipment. This is accomplished because no coil or heater is located in the bottom of the tank. Not only is there an appreciable saving in the solvent but a great deal of time is saved in heating the cleaning compound. The new degreaser can be heated with high pressure steam without the use of a pressure-reducing valve, or with gas or electricity without any possibility of overheating the solvent at any time. The degreaser is also equipped with an automatic control system that pre-heats the circulating water above the dew point. An automatic oil and grease skimming device is standard equipment and has been so engineered as to require no attention. Distillation is handled in the equipment completely without danger even when the last drops of solvent are being distilled.

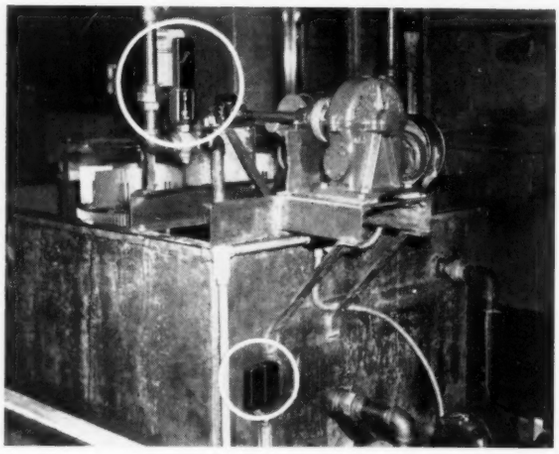
To install the degreaser one simply connects the heat and water lines. It is equipped with all safety controls and is built in many standard sizes and may be custom built for vapor, vapor spray, liquid vapor, and liquid liquid vapor. In addition, conveyorized machines can also be built for any kind of cleaning problem in any size. For additional information, quotations, engineering data, etc., write to the Mabor Co., Dept. MF, Walnut St., Clark Township, N. J.

BARBER-COLMAN

AUTOMATIC CONTROLS

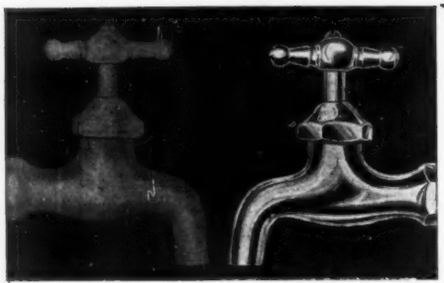
PROVIDE UNIFORM

QUENCH TANK TEMPERATURE



You can have uniform temperature in the quench tank, *automatically maintained,* with this accurate, durable, easy-to-install Barber-Colman Control System. A Motor-Operated Proportioning Valve, capable of taking and holding any position between full open and completely closed, is installed on the cold water supply line. Its position is determined by a thermostat set in the side of the tank. As the tank temperature tends to rise or fall, the flow of cold water is *automatically adjusted* exactly enough to provide a constantly uniform quench temperature. The result is increased production of exceptionally uniform quality. *Write for details.*

BARBER-COLMAN COMPANY
1205 ROCK ST. ● ROCKFORD, ILL.



New Improved

LUSTREBRIGHT

Bright Nickel Process

Produces Brilliant, Lustrous Nickel Deposits.
Eliminates Color Buffing—Re-Cleaning—Re-Racking.
An Ideal Base for Chromium. Excellent Throwing Power.
No Special Solutions or Changes in Equipment Required.
Easy to Control—Low in Cost—Successful—Practical.

Uniform results obtained on all classes of work in still tanks or mechanical barrels. Excellent for zinc die-castings. Any cold nickel solution of standard formula will with the addition of NEW IMPROVED LUSTREBRIGHT give brilliant, lustrous, adherent deposits. Guaranteed not to harm plating solution. Will not cause plate to peel, become brittle or produce streaky deposits. Illustration shows unbuffed deposits produced before and after addition of NEW IMPROVED LUSTREBRIGHT. Write for complete information.

W. C. BRATE COMPANY
14 MARKET ST. *Est. 1860* ALBANY, NEW YORK

Steam Cleaning Detergent

Promising even greater speeds and lower costs for industrial steam-cleaning operations, a new heavy-duty alkaline-type detergent specially designed for use in modern steam guns and coil-type steam-generating mechanisms has been announced by Oakite Products, Inc.

The new high-speed detergent, called Oakite Composition No. 92 has been pretested during the past year. Decisive reductions in time and cost allocations for such jobs as the following are said to have been recorded: Cleaning machinery and equipment parts for subsequent repair and overhaul, preparing equipment surfaces for repainting or refinishing, cleaning equipment too large for tank immersion or where suitable tanks are not available, paint stripping and other cleaning operations.

The new Oakite detergent is described as giving highly thorough and fast steam-cleaning action at very low concentrations. Specialized advantages associated with the product by the manufacturer include: Prevention of scale clogs in steam coils; ready dissolution in hot water; free-rinsing action on all surfaces; safe and pleasant handling without offensive fumes or toxic vapors.

Free Service Report describing this new material may be secured by writing on company letterhead to Oakite Products, Inc., Dept. MF, 26 Thames St., New York 6, N. Y.

Business Items

E. V. COLLINS JOINS R. O. HULL & COMPANY

E. V. Collins has been appointed sales and technical service representative throughout Ohio and Indiana for *R. O. Hull & Co.*, 1279 West 3rd Street, Cleveland, Ohio, manufacturers of electroplating specialties, and Ohio distributors for *Enthone, Inc.*

Formerly connected with the *Chromium Corporation of America* both in Waterbury, Conn., and Cleveland, Mr. Collins has ample practical background in the plating field. He also spent a number of years

E. V. Collins

with the *D. L. & W. Coal Co.* (anthracite) as research and service chemist, and previous to that was in charge of chromium plating at the Pyrene Manufacturing Co., Newark, N. J.

Mr. Collins attended Brooklyn Polytechnic Institute, Brooklyn, N. Y. He has recently been elected secretary-treasurer of the Cleveland Branch of the *American Electroplaters' Society*.

GERITY-MICHIGAN DIE CASTING APPOINTS JAY THOMAS FORD

Announcement has been made of the appointment of *Jay Thomas Ford* as chief chemist of *Gerity-Michigan Die Casting Co.*, producers of plating and die casting. He will be attached to the *Adrian Division* of the company.

Mr. Ford has been chief chemist for the

Jay Thomas Ford

A. C. Spark Plug Division of *General Motors Corp.* for the past 21 years. Previously, he spent 3 years as a metallurgical engineer for *Hoskins Manufacturing Co.* and 2 years as an instructor in chemistry at *Wayne University* of Detroit. Mr. Ford, who has been granted several U. S. patents in plastics and electroplating, is a member of Sigma Psi, national honorary scientific society, the *American Chemical Society*, and the *American Electroplaters' Society*.

PENNSALT ANNOUNCES APPOINTMENTS

Appointment of *Walker Penfield* as manager of manufacturing of the *Pennsylvania Salt Manufacturing Co.* was announced recently by *Y. F. Hardcastle*, vice president in charge of manufacturing.

Mr. Penfield formerly was works manager, a position discontinued in a reorganization of Pennsalt's Manufacturing Department. The reorganization was necessary because of the increase in volume of production and number of new Pennsalt products, Mr. Hardcastle said

Mr. Penfield will assist and advise the vice president in charge of manufacturing on improvement of manufacturing operations and fixing of manufacturing policies for all of the Company's manufacturing operations except those controlled by *Pennsylvania Salt Manufacturing Company of Washington*.

Claude S. Beldin, regional superintendent, was appointed to the newly created position of production manager. Mr. Beldin will be in charge of production control, overall supervision and responsibility for production, works storage and preparation for shipment of all products except those produced by the Pennsylvania Salt Manufacturing Company of Washington.

Henry G. Meyer, formerly assistant to the works manager, was named assistant to the production manager, and *Russell E. Cushing*, director of chemical engineering, now reports to *W. F. Mitchell*, superintendent of the Wyandotte, Mich., plant.

Mr. Penfield came to the company from *General Chemical Co.* in 1928. He started in the development and research department, becoming manager of engineering in 1932 and works manager in 1943.

Mr. Penfield makes his home in Swarthmore, Pa. He is a graduate of Williams College with A.B. degree in chemistry, and served in the U. S. Naval Reserve in the first World War. He is a member of the *American Institute of Chemical Engineers*.

Mr. Beldin graduated with a B.S. degree in chemistry at Villanova College and joined the company in 1926. His first assignment was that of chemist in the research and development department.

DUNN PRODUCTS IN NEW QUARTERS

Dunn Products has announced that they are now located at 1214-22 West Madison St., Chicago 7, Ill.

FOR THE TOUGHEST PLATING CYCLES!

UNICHROME*

RACK COATINGS

No matter how tough the plating cycle, Unichrome air-dry and force-dry rack coatings stand up and deliver long, satisfactory service. You can specify either with complete assurance of durable rack protection and minimum recoating costs.

Coating 203 is air dried at room temperature. Where the convenience of air drying is preferred, this coating is recommended for all plating cycles .. including chromium, nickel, and cyanide baths.

Coating 202 is especially recommended where force drying facilities are available. It has the same outstanding chemical resistance as Coating 203, with force drying increasing its adhesion and toughness.

Both coatings are the result of years of intensive research in the field of synthetic resins. Chemically resistant to all plating cycles, they also have the mechanical strength to withstand repeated flexing and shop handling. They are easy to apply too—by simply dipping. Write today for prices and data. Make United Chromium your protective coating headquarters.

*Reg. U. S. Pat. Off

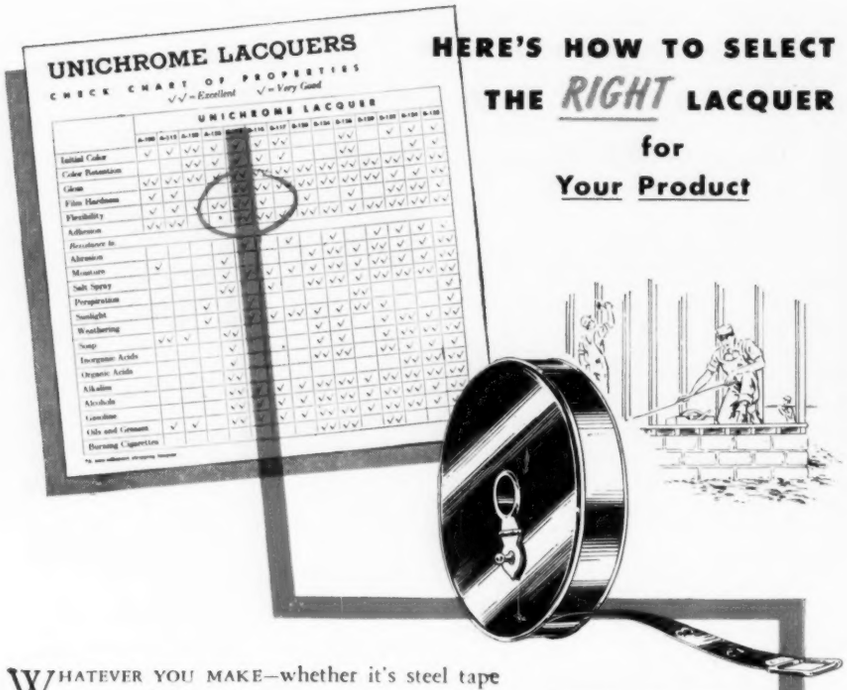
COATING 203 FOR AIR DRYING

COATING 202 FOR FORCE DRYING

UNITED CHROMIUM, INCORPORATED

51 East 42nd Street, New York 17, N. Y.

Detroit 7, Mich. Waterbury 90, Conn. Chicago 4, Ill. Dayton 2, Ohio



HERE'S HOW TO SELECT THE *RIGHT* LACQUER for Your Product

WHATEVER YOU MAKE—whether it's steel tape or heavy industrial machinery—you can select the *right* lacquer for the job, quickly, easily, and accurately, with the "check chart" above. List the required physical properties and the corrosive influences which your product must withstand—then check those requirements against the chart. The lacquer that rates highest on major points is the one to specify—the one you can rely on to stand up longer in actual service.

For complete information, write today to your nearest United Chromium office.

***CONSIDER THIS STEEL TAPE,*—the most important requirements were good adherence, great flexibility and extra film hardness to resist wear and abrasion. The "check chart" showed that B-115 rated excellent (√√) in all three. Thus, a *standard* coating was selected for a *special* application. The result—a better product with longer service life.**

UNICHROME

PROCESSES AND MATERIALS FOR SURFACES THAT SURVIVE

Chromium Plating · Porous Chromium · Unichrome* Copper Unichrome Lacquers · Ucilon* Protective Coatings · Unichrome Stop-Off Lacquers and Compounds · Unichrome Dips · Unichrome Rack Coatings · Anozine* Compounds Unichrome Strip

* Trade Mark Reg. U. S. Pat. Off.

UNITED CHROMIUM, INCORPORATED
51 E. 42nd St., New York 17, N.Y.

Detroit 7, Mich. • Waterbury 90, Conn. • Chicago 4, Ill. • Dayton 2, Ohio • Los Angeles 11, Cal.

HOOKER - DETREX CORPORATION FORMED

The *Hooker-Detrex Corporation* has been incorporated under the laws of the State of New York with a capitalization of 6,000 shares of preferred stock and 1,500 shares of common stock.

This is a corporation jointly owned by *Hooker Electrochemical Co.* whose main office is located at Niagara Falls, N. Y., and *Detrex Corp.* whose main office is located in Detroit, Mich.

The corporation has been formed for the purpose of manufacturing chlorinated solvents, the distribution and sales of which will be handled by the Detrex Corporation.

The officers of the Corporation include *E. R. Bartlett*, president; *A. O. Thalacker*, first vice-president; *R. L. Murray*, second vice-president and *G. E. Powers*, treasurer.

The Board of Directors is composed of these four officers and in addition *R. A. Emmett* and *H. M. Hooker*.

The site for manufacturing operations will be located in the Pacific Northwest where various materials are available and from which point distribution to West Coast markets will be handled. It is understood that the location will be adjacent to the property now occupied by the Hooker Electrochemical Co. in Tacoma, Wash., between Alexander Ave. and Hylebos Waterway.

Civilian Production Administration approval has been recently granted for the necessary construction work and the ground will be broken immediately looking toward production late in the year.

HAGAN CORPORATION TRANSFERS GERALD G. LIPKE

Gerald G. Lipke, recently returned from the Army to his former connection with *Hagan Corp., Hall Laboratories and Calgon, Inc.*, has been transferred to Denver, Colo., as district field engineer.

Gerald G. Lipke

Mr. Lipke will work with the companies' representative in the Denver area, the *Denver Fire Clay Co.* He will assist in servicing industrial water conditioning work involving the use of sodium metaphosphate in boiler waters and vitreous sodium phosphate, known as Calgon.

Mr. Lipke was graduated from the University of Pittsburgh and joined the company in 1936, left it in 1941 to enlist in the armed forces, and returned to it in January, 1946. He went in as a second lieutenant in the Coast Artillery, served in both the European and Pacific theaters and ended his service as a lieutenant-colonel. In Europe he was with the Third Army. In the Pacific he was at Cebu in the Philippines, getting ready for the Japanese invasion. He put in one year in harbor and coastal protective submarine mine work on the Atlantic coast.

H-VW-M APPOINTS NEW SALESMEN

The *Hanson - Van Winkle - Munning Co.*, Matawan, N. J., has augmented its field and service force by the addition of three new

Willard W. Boeswetter

Carroll A. Pickering

men: *Willard W. Boeswetter, Carroll A. Pickering* and *Eugene B. Hauser.*

Willard W. Boeswetter was graduated from the Milwaukee School of Engineering in 1940 with the degree of Bachelor of Science in Electrical Engineering. He was, prior to the war, engaged in the electrical manufacturing field, and from 1941 to 1943 was an instructor in the U. S. Army Air Forces, Aviation Engineering Cadet School. From then until 1946 he served in the U. S. Naval Reserve with the rank of Lieutenant. Mr. Boeswetter has been assigned to the main office at Matawan, N. J., in electrical sales work.

Carroll A. Pickering was graduated from the University of Wisconsin with the degree of Bachelor of Science in Chemistry and also took a specialized course in Industrial Chemical Engineering. Prior to the war he was employed by *Fairbanks Morse & Co.*, as an electrochemist. He recently was discharged from the United States Navy. Having completed a special sales training course at Matawan, Mr. Pickering is in the Chicago Office as a field engineer.

Eugene B. Hauser was employed as a design engineer at the main office of the company from 1940 to May, 1942. Thereafter

Eugene B. Hauser

. . . in this full-automatic plating cycle at GE

For pleasing brilliancy, corrosion protection and prevention of stains and fingermarks during assembly, without effect on electrical conductivity or solderability, General Electric chose Luster-on* bright dip for the speaker shells, chassis and other zinc-plated parts of its 1946 radio line.

To meet the needs of their full automatic plating equipment, our engineers developed the new *Conveyor Type* Luster-on* Acid — a specially buffered product to give the same fine results as regular Luster-on*, but with *6—7 times slower* action so as not to require mechanical delayed action transfers.

Conveyor Type Luster-on* is even more economical than that used in hand operated cycles — another powerful advantage.

If you use zinc-plating, you need Luster-on* — available now in *two* types, for hand or automatic use. Write for full details today.

*Patent applied for

THE Chemical CORPORATION
54 Waltham Ave., Springfield 9, Mass.

12

THE CHEMICAL CORPORATION
54 Waltham Ave., Springfield 9, Mass.

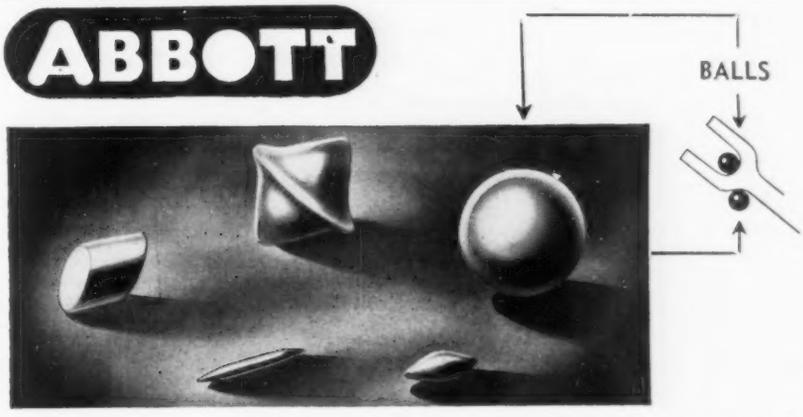
Please send me full particulars about Luster-on* bright dip for zinc surfaces. I am (am not) sending sample part for free dip. No obligation, of course.

Name.....

Address.....

Metal Finishing, July

ABBOTT



SAMPLE KIT
Send for a Sample Kit of Abbott Materials. A variety of sizes and shapes.

Notice how effectively the steel balls make contact on the curved surface of the part illustrated . . . you may rely on ABBOTT Burnishing Balls and other shapes (Cones, Pins, Slugs) to prepare the base metal of your product for plating . . . Abbott materials will also bring up the final color on the plate . . . Abbott's scientifically controlled heat treatment assures built-in quality—good for extended periods of service.

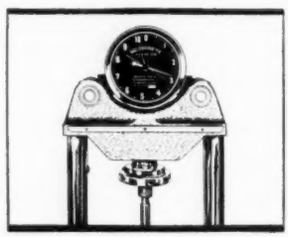
THE ABBOTT BALL COMPANY 1046 NEW BRITAIN AVE HARTFORD 10, CONN

Portable Tester Checks Tensions Up To 10,000 lbs.— Right at the Workbench!

Standing only 37" high, weighing but 137 lbs., the Dillon Universal Tester checks wire, copper, aluminum, fabrics, steel, etc. for tensile, transverse, compression and shear strengths. Available in 7 capacities, with interchangeable dynamometers, the Universal will test from 0 to 10,000 lbs. Special gripping jaws are made for every requirement.

The Universal Tester may be either hand or motor operated. No special training is needed to record accurate results instantly on the dynamometer. It is compact, simple, inexpensive—designed for small shops and plants everywhere.

Tests prove that workers, too, undergo strain and nervous tension on the job. That's why many factories urge workers to chew gum. Workers can chew Wrigley's Spearmint Gum right on the job—even when hands are busy. And the act of chewing helps relieve monotony—helps keep workers alert, thus aiding them to do a better job with greater ease and safety.



Interchangeable Dynamometer

You can get complete information from
W. C. Dillon & Company, Inc.
5410 W. Harrison St., Chicago 44, Illinois

AA-78

until April, 1946, he served with the United States Navy with the rank of Lieutenant. Following a special sales training course at Matawan, he has been assigned to the New York City office of the company, 30 Church St. Mr. Hauser is a graduate of Stevens Institute of Technology with the degree of Mechanical Engineer, having specialized in chemistry.

WALTER C. KERRIGAN HEADS INCO'S NICKEL SALES DEPARTMENT

Appointment of *Walter C. Kerrigan* as manager of the Nickel Sales Department of *The International Nickel Co., Inc.*, to succeed the late *Rudolph L. Suhl*, is announced by *Dr. John F. Thompson*, executive vice-president of the company.

Mr. Kerrigan has been associated with business in metals and ores since 1919. He joined the company in 1930 and has been an assistant manager of its Nickel Sales Department since January, 1933. During World War I he served in the U. S. Navy.

MILTON KUTZ RETIRES

Milton Kutz, whose career in the chemical industry ranged from office boy to executive positions, retired recently from the *Du Pont Co.*

Until December, when he decided to retire, Mr. Kutz was assistant general manager of Du Pont's Electrochemicals Department.

Forty-nine years ago, Mr. Kutz joined the *Roessler and Hasslacher Chemical Co.* as an office boy. In 33 years he rose to vice president and director of the firm. When Roessler and Hasslacher was acquired by Du Pont in 1930, he became director of sales. In 1933, he became assistant general manager of the department.

Mr. Kutz is a native of Logansport, Ind., and was educated in New York public schools. He is widely known in the electrochemicals field, for he had long worked as a salesman in the New York, New Jersey, and Pennsylvania area. In 1922, he became general sales manager of Roessler and Hasslacher and from 1928 to 1930 he was vice president and manager of sales.

Mr. Kutz is a member of the *American Chemical Society*, and the *Chemists Club of New York*.

DETREX OPENS NEW BRANCH AT GRAND RAPIDS

Detrex Corporation, Detroit 32, Mich., producers of industrial metal cleaning equipment and chemicals, has opened its new Grand Rapids office and warehouse at 435 Ionia Ave., S. W., Grand Rapids 2, Mich., according to an announcement made by *A. O. Thalacker*, vice president and general manager.

The opening of this new office is part of a general expansion program to meet the increased demand for Detrex products and services.

The main offices and plant headquarters of the Detrex Corporation are now located at 14331 Woodrow Wilson Ave., Detroit, Mich.

DON WOOD FORMS COMPANY

Hill Cross Company, 125 Seventh Ave., Brooklyn, N. Y., has been established by *Don Wood* who is well known in the plating industry. The company will do contract plating, principally precious metals in heavy coatings. The company will also do contract stripping of racks or plated articles.

Mr. Wood was formerly associated with *National Silver Co.*

ROYAL F. CLARK JOINS DE MORNAY BUDD, INC.

Royal F. Clark, Sr., now in his 46th consecutive year in the electroplating field, has resigned his position as supervisor of the plating division at the New York plant of *Allied Control Co., Inc.*, to accept a position as foreman plater in the plating department of *De Mornay Budd, Inc.*, Bronx, N. Y.

GAYBEX CORP. ANNOUNCES PERSONNEL CHANGES

Gaybex Corp., Nutley, N. J., announces the appointment of *C. F. Rowlands*, formerly with *Wright Aeronautical Corp.*, as sales manager in charge of the domestic wholesale sales department.

J. J. Parker of Norfolk, Va. has been appointed as district sales representative for the State of Virginia. *W. A. Church* has joined the Home Office sales staff in North-

ern New Jersey; and *Sidney E. Newman*, formerly with *Warner Brothers Co.*, will join the *Harris Pump & Supply Co.*, Western Pennsylvania Distributors for Gaybex Corp. as resident factory representative in Pittsburgh.

DR. FOSTER DEE SNELL HEADS THE AMERICAN INSTITUTE OF CHEMISTS

Dr. Foster Dee Snell, president of *Foster D. Snell, Inc.*, Consulting Chemists and Engineers of 305 Washington St., Brooklyn 1, N. Y., was elected president of the *American Institute of Chemists* at its annual meeting held May 17th at the Hotel Biltmore, succeeding *Dr. Gustav Egloff* of *Universal Oil Products Co.*, Chicago. *Dr. Joseph Mattiello*, technical director of the *Hilo Varnish Co.*, was elected as vice president, succeeding *Dr. Donald Price*, technical director of *Oakite Products, Inc.*, New York. At the same meeting reelection of *Dr. Lloyd Van Doren*, patent attorney of New York as secretary and *Frederick A. Hessel*, president of the *Montclair Research Corp.* of Montclair, N. J., as treasurer was announced. New councilors elected for three years were *Dr. Donald B. Keyes*, vice president of *Heyden Chemical Corp.*; *Dr. Raymond E. Kirk*, dean of the graduate school and head of the Department of Chemistry of *The Polytechnic Institute*, Brooklyn, N. Y., and *Dr. Donald Price*.

FRED W. WORCH DIES

As we go to press, we learn of the death of *Mr. Fred W. Worch*, president, *Williamsville Buff Manufacturing Co.*, Danielson, Conn. Mr. Worch passed away Friday, June 14th. He was well known in the metal finishing industry and for many years attended the annual Conventions of the A. E. S.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

CARL LUND ADDRESSES LOS ANGELES BRANCH

A talk on the significance of good bonding in buffing and polishing was presented at the June 10 meeting of Los Angeles Branch, *A.E.S.*, by *Carl Lund*, Los Angeles representative, *George A. Kushman Co.* of Oakland, Calif.

The subject was originally scheduled to be presented jointly by Mr. Lund and *J. J. Seifen* of the *J. J. Seifen Co.*, Detroit, who was in Los Angeles early in June. Mr. Seifen, however, found it necessary to leave the city before meeting night, with the result that the talk was handled entirely by Mr. Lund.

Branch President *D. E. Eldred* presided at the business session. *Cliff Grace* and *Felton J. Jones* of *Precision Gauge Plating Co.*, and *Kenneth A. Holder* of *Plomb Tool Co.* were initiated into membership.

The following visitors were introduced: *Paul Douglas*, Bendix Corp.; *James F. Tuchsler*, O'Keefe & Merritt; *Roy Warner*,

A BUFFING ROOM BOTTLENECK REMOVED!

by a new Wyandotte development . . .

a soluble buffing compound that removes readily from buffed surfaces.

Wyandotte Buffing Compound—specifically designed for zinc base die castings and aluminum—eliminates the labor and costs of vapor degreasing and emulsion pre-cleaning . . . and gives excellent results in cutting and coloring operations.

Shown above are two bars of buffing compounds—a Wyandotte bar and a representative competitive bar. Both measure approximately 2″x2½″x8″.

Both bars were given identical treatment—(1) thirty-minute partial immersion in tap water, 125° F. and (2) ten-minute partial immersion in sulphuric acid solution, 2½% by volume, room temperature.

Note the solubility of the *Wyandotte* bar to both water and weak acid solution. The ease with which this Wyandotte compound can be removed should help you with your production problems.

Let your Wyandotte Service Representative demonstrate for you the remarkable quality of Wyandotte Buffing Compound. All you have to do is give him a call.

Wyandotte
REG. U. S. PAT. OFF.

WYANDOTTE CHEMICALS CORPORATION • J. B. FORD DIVISION
WYANDOTTE, MICHIGAN • SERVICE REPRESENTATIVES IN 88 CITIES

For more than 10 years BUNATOL has been recognized as the leader in insulation for electro plating and anodizing racks and fixtures.

Here is a new BUNATOL No. 785, a rack insulation particularly adapted for insulating racks for decorative plating (Copper-Nickel-Chrome).

It's a heavy-body, free-dipping liquid that can be handled with less labor cost. Only one material and one tank needed. No. 785 does produce a superior rack insulation.

May we send you complete information?

NELSON J. QUINN COMPANY, TOLEDO 7, OHIO

BUNATOL

STAINLESS STEEL POLISHING COMPOUNDS

If It's Stainless Steel Polishing It's a "4-A" Job

It's been proved every day in every kind of metal working plant: "4-A" Polishing Compounds are faster, more efficient and more economical for cutting down, polishing and mirror finishing all kinds of steel, including stainless and radium.

CEMENT AND THINNER

Use it with any kind of wheel —soft, medium or hard—and the results will speak more eloquently than anything we could say.

Tell us about your toughest job, and we'll be glad to send the "4-A" product that will solve your problem No obligation, of course

Instead of glue, use "4-A" Cement and Thinner, a uniform substitute for polishing Wheels, Belts, Buffs, Rolls, etc Samples of Compound or Cement sent on request

HARRISON & COMPANY HAVERHILL, MASS.

Fine Metals Finishing Co.; *J. R. McQueen*, A. J. Lynch Co., and *E. E. Lynch*.

The chair announced that membership certificates and silver membership lapel buttons were now available from the secretary at nominal prices, and that branch past presidents are eligible to wear silver buttons with a "Past President" tab.

Marcus Rynkofs of the *Liberty Plating Co.*, announced that he would be unable to avail himself of the honor accorded him at the last meeting when the branch voted to support him as a candidate for Supreme Third Vice-President at the Pittsburgh convention. Pressure of business and the multifarious details entailed in the construction of his new plating plant, Mr. Rynkofs said, precluded his candidacy as he would not, if elected, be able to devote the necessary time to the national office.

Earl Coffin, *Don Bedwell* and *Al Spicer* were named as a committee to investigate the advisability of purchasing a public address system for use at branch meetings and annual conventions.

Following its annual custom, the branch will hold no meetings in July and August. The meeting schedule for the 1946-47 season will get underway September 9.

AMERICAN SOCIETY FOR METALS

DR. MUDGE ELECTED CHAIRMAN OF N. Y. CHAPTER

Dr. William A. Mudge, assistant director of the Technical Service of *International Nickel Co.'s Development and Research Division*, at New York, has been elected chairman of the *New York Chapter* of the *American Society for Metals*, to serve during the coming year, 1946-47. During the past year Dr. Mudge has been chairman of the Technical Program Committee.

Returning from World War I as an infantry captain, he entered Columbia University for post-graduate work, and received his Ph.D. in 1920. Soon after Dr. Mudge became associated with the Nickel Company as refinery superintendent and metallurgist at the Huntington Works. He was appointed to his present position in April of 1940.

Dr. Mudge is the author of many technical papers on nickel and nickel alloys.

H. L. GEIGER ELECTED CHAIRMAN OF CHICAGO CHAPTER

Harold L. Geiger, head of the Chicago Technical Section of the Development and Research Division of *The International Nickel Co., Inc.*, has been elected chairman of the Chicago Chapter of the *American Society for Metals* for the year beginning September, 1946. During the past year he served as vice chairman of the Chicago Chapter.

Mr. Geiger has been with International Nickel for many years. He was formerly chief metallurgist of the *Wisconsin Steel Co.*, a subsidiary of *International Harvester*, and previously with the operating and metallurgical departments of the *Inland Steel Company*.

ELECTROCHEMICAL SOCIETY

At the annual meeting of the *Metropolitan Section* of the *Electrochemical Society*, *F. L. LaQue*, New York metallurgist and an authority in the field of corrosion, was elected to the executive committee, to serve for the coming season, 1496-47.

After receiving his degree of Bachelor of Science in Chemical and Metallurgical Engineering from Queen's University, Kingston, Ontario, in 1927, Mr. LaQue became associated with the development and research division of *The International Nickel Co., Inc.*, devoting his activities to the field of corrosion and corrosion-resisting materials. Between 1937 and 1940 Mr. LaQue was assistant director of technical service on mill products for International Nickel, and at the present time he is engaged in development activities on all applications of both ferrous and non-ferrous nickel-containing alloys.

ARCHITECTURAL PORCELAIN ENAMELERS SET UP STANDARD SPECIFICATIONS

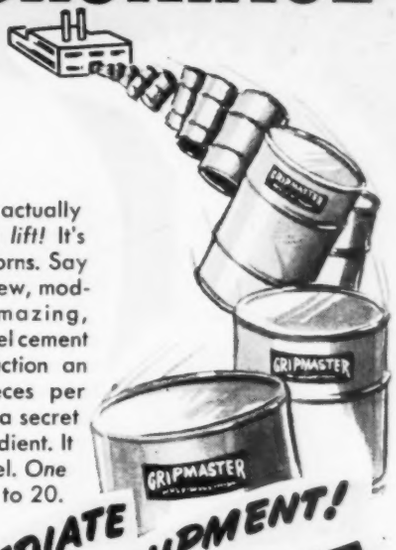
Standard specifications covering the manufacture of architectural porcelain enamel have been officially approved and adopted by the Architectural Division of the *Porcelain Enamel Institute*.

The standards prescribe in general detail the proper materials and methods to be used in designing, fabricating and processing parts for architectural porcelain enamel. They were prepared by a special committee, with the aid of a highly skilled architectural specifications writer, and were approved by the Division only after long study and revision of several preliminary drafts. They are concisely phrased in terminology that is familiar to the architect, according to *H. R. Spencer*, of *Erie Enameling Co.*, chairman of the Institute's Architectural Division, who announced the new standards following a recent Division meeting in Washington, D. C.

With the rapid growth in the demand for porcelain enamel for construction purposes, architects have given recognition to its outstanding durability and beauty and to the design possibility inherent in its adaptability to form. However, they have been handicapped in their desires to utilize it more widely because of a lack of authoritative information on how to specify it to insure high quality of manufactured product. These standards of manufacture have been developed to meet this need, according to the Committee. They assure the architect of a high quality of porcelain enameling on the products that he buys. They will also promote public confidence in the serviceability of porcelain enamel structures.

Acceptance of these standards of manufacture by active members of the Porcelain Enamel Institute has been established as the requirement for becoming a member of the Architectural Division. A form for this purpose, entitled "Acceptance of Standards," will be sent upon request to those desiring it. Copies of the specifications may be had by writing to the Institute offices, 1010 Vermont Ave., N.W., Washington 5, D. C.

HOW TO BEAT THE GLUE SHORTAGE



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Manufacturers' Literature

Publications listed in this department are obtainable from the manufacturer without charge.

Rectifiers

Rectifiers for Electrodeposition is the title of a 12-page reprint which is available on request to the *W. Green Electric Co.*, Dept. MF, 130 Cedar St., New York 6, N. Y. This paper was written by *L. W. Reinken*, chief engineer of the company, and presented by proxy at the annual educational session held by the *Los Angeles Branch* of the *American Electroplaters' Society*.

Tank Rheostats

A new catalog bulletin has been issued by *Columbia Electric Mfg. Co.*, Dept M. F., 4519 Hamilton Ave., N. E., Cleveland 14, Ohio. This Catalog No. 500 has been completely revised and brought up-to-date. It describes and illustrates the rheostats and other products manufactured by the company.

Handling Corrosive Liquids

General Ceramics Bulletin 201, now available, describes in full detail chemical stoneware apparatus for moving liquids with compressed air. Three types of corrosion-resistant acid elevators are shown, with figures, parts lists, dimensions and capacities special designs, suggested applications, and installation drawings.

Simplicity of design was the primary consideration in constructing these acid elevators, thus comparatively low first cost, ease of maintenance and operation, and low consumption of compressed air are achieved.

The two main devices are the acid elevator, manually or automatically operated, and the pulsometer or monkey pump.

In operating the manual type, suitable for batch operation, the elevator is filled with liquid to be moved, the liquid inlet valve closed, and pressure applied to the contents by means of compressed air. The automatic type, used where continuous operation is required, is constructed so that when the vessel becomes empty the air pressure is automatically shut off and bled to the atmosphere and the vessel filled again with the acid.

The pulsometer utilizes the air lift principle and transports liquid by means of slugs of air. The pulsometer is a very simple device consisting of a chamber with three openings for air inlet, liquid inlet and liquid outlet.

All three devices described in the new bulletin are corrosion-proof with all acids except hydrofluoric.

For copies of bulletin 201 write General Ceramics and Steatite Corporation, Dept. MF, Keasbey, N. J.

Plating Barrels

Modern Plating Barrels of all types and sizes are described and illustrated in a new catalog issued by Belke Manufacturing Co.,

Dept. MF, 947 N. Cicero Ave., Chicago 51, Ill.

Information and specifications on barrels from small lot to large multiple units are given. Unusual construction features of Belke Barrels are detailed. Materials used in making barrels for various types of plating are listed. Information on dryers, burnishing barrels and other plating equipment is also included.

Steel Cleaners

A four-page color leaflet describing Pennsalt steel cleaners made for electroplaters has been published by the *Pennsylvania Salt Mfg. Co.* The leaflet describes a typical cycle for low carbon steel processing and discusses solvent emulsion-type precleaners, solvent-alkali combination for precleaning, alkaline soak tank cleaners, alkaline electro cleaners and specialty acid-type descaling products. The leaflet is available on request at the company's main office, Dept. MF, 1000 Widener Bldg, Philadelphia 7, Pa.

Temperature Control Instrument

H-B Instrument Co., Dept. MF, 2519 North Broad St., Phila. 32, Pa., has issued a new, 16-page, 8½" x 11" catalog which profusely illustrates and describes in detail the complete H-B line of temperature control instruments which include relays, mercury plunger and sensitive types, thermostats and Red-Top thermo-regulators. These instruments are designed to maintain any holding points of range levels, as specified, between minus 30° F. and 500° F., with a sensitivity of within 1/10 of 1° F. of the specified control points. They are used for accurately controlling constant temperature of ovens, heating baths, refrigerants, etc.

News from California
By FRED A. HERR

D. V. Eldred has resigned after 26 years' service with the *DuPont Co.* and has affiliated himself with *Hallenscheid-McDonald Co.* of Los Angeles, manufacturers of bathroom fixtures.

Mr. Eldred resigned from the DuPont organization in mid-April and after a month's vacation took over in mid-May the post of assistant to *Donald Bedwell*, general superintendent of the Hall-Mak Co. The company is at present engaged on a huge building expansion program involving modernization and enlargement of its plating department, including the installation of new full automatic plating equipment, at a cost of more than $100,000.

A full automatic conveyor plating installation, 118 feet long and using 9,500 gallons of bright zinc solution is being used by the *Bauer Manufacturing Co.* of Los Angeles for work on electric outlet boxes and switches, building hardware and other peacetime production. The plant has been completely reconverted from wartime work on extruded shell cases, which the Bauer Co. handled on sub-contract from *Norris Stamping and Mfg. Co. William Trickey* is plating superintendent for the Bauer Co.

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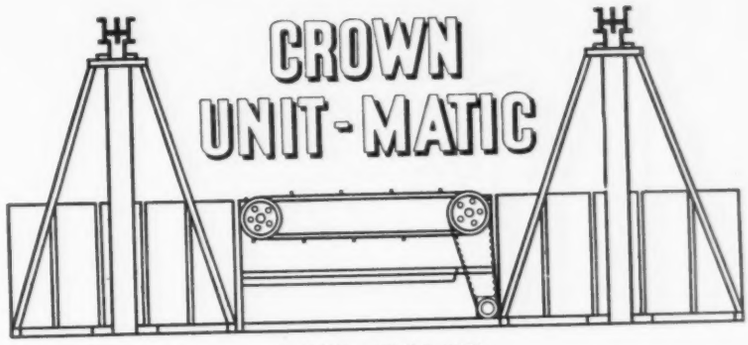
BRINGS TO THE PLATING INDUSTRY THE OUTSTANDING EQUIPMENT DEVELOPMENT DURING THE PAST QUARTER OF A CENTURY



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One of the largest silver plating installations in the Far West is being installed in the metal finishing department of the *Metalair Co.*, 1014 East Olympic Blvd., Los Angeles, manufacturers of copper and brass household dishes and allied items.

James P. ApRoberts has announced his appointment as deputy purchasing agent for a Navy Research project being carried on in the School of Engineering of the University of Southern California, Los Angeles.

Spence Electro-Plating Co., 528 East 15th St., Los Angeles, has announced plans for a new shop building costing $20,000. The new building will be of reinforced concrete and steel construction, measuring 45 x 118 feet. The firm operates one of the largest anodizing plants in Los Angeles for treatment of aluminum and aluminum alloys, and also does zinc die casting and mechanical plating.

A 375,000 square foot plant erected at 19200 South Western Ave., Los Angeles, in 1942, at a cost of $8,144,000 by the Reconstruction Finance Corp. for wartime use by the *Bonn Aluminum and Brass Corp.*, has been purchased by the *Harvey Machine Co., Inc.*, of Los Angeles. It will be used by the Harvey Co. for the production of aluminum and brass extrusions and radio parts and washing machines.

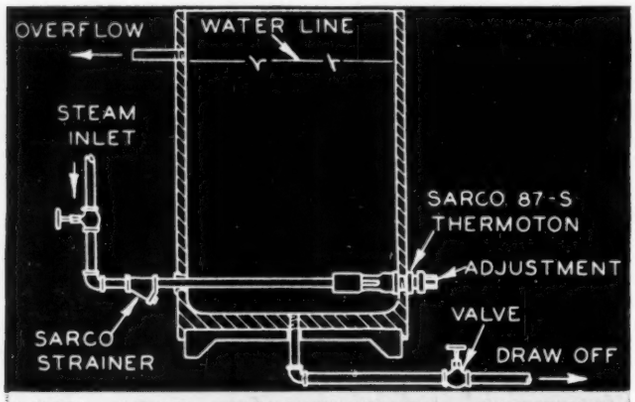
Kelite Products, Inc., manufacturers of cleaning compounds and pH equipment and measuring devices, will build a one-story, reinforced concrete building, 108 x 200 feet in area, at 1250 North Main Street, Los Angeles. The cost is estimated at $75,000.

Dr. H. Waterman, head of the department of chemical engineering, University of Southern California, gave a talk on "*Plating and Finishing*" at the last monthly meeting of Los Angeles Chapter, *American Society for Metals*, at Rodger Young Auditorium, Los Angles. Dr. Waterman's talk covered the fundamentals of plating and finishing, which he classified as an "art" rather than a science.

Fred W. Herman, chief engineer of the *Douglas Aircraft Co.'s* Blackout Plant in Long Beach, Calif., for the past five years, has been named plant manager, succeeding *A. C. Wallen*, who has been transferred to the post of production manager at the Santa Monica plant of the firm.

Consolidation of three of the oldest commercial testing laboratories in the West was completed in June with the merging of the interests and operations of *Smith-Emery Co.*, *R. A. Perez Co.* and the *John Herman Laboratories*, assayers and chemists. The activities of the Perez Co. and the Herman Laboratories have been consolidated in the buildings of the Smith-Emery Company.

Square D Co. of Los Angeles has construction under way on a new factory building of 13,000 square feet floor area at 4335 Valley Blvd., which, upon completion this fall, is to be used for the production of electric switches and panelboards, switchboards and other electrical control equipment.



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